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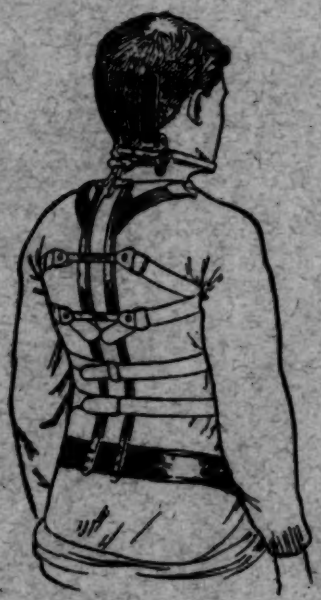

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The Journal *of* Orthopædic Surgery

THE OPERATIVE TREATMENT OF IRREDUCIBLE PARALYTIC DISLOCATION OF THE HIP JOINT

ELLIS JONES, LOS ANGELES

In 1913, Albee proposed an operative method of retention of the femoral head in dislocations of the hip where the acetabulum is shallow and the hip will not stay in place after a reasonable trial by the bloodless method. By this operation a superior curved lip of bone is turned down to overhang the deficient acetabulum and maintain the reduced femoral head. The position of the overhanging lip or rim is maintained by tibial bone grafts. This method the writer has used successfully in four cases of simple paralytic luxation of the hip joint. In these cases before operation the luxation could be reduced and created at will. The operation included reefing the capsule, and was followed by plaster fixation for from three to five months. Sufficient muscle activity was present to give good functional hip joints without anchylosis and with excellent stability.

The writer's interest in the application of this method to so-called *irreducible* paralytic dislocation of the hip joint was acutely stimulated in August, 1917, in the study of the following case:

W. R., male, age 18. Student. Infantile paralysis at eighteen months. Examination showed an extreme flexion adduction deformity of the right hip with nine and one-quarter inches of apparent shortening. The trochanter was four inches above Nelation's line. (Plate 1.)

The head of the femur could be seen and felt high up on the dorsum of the ilium. The adductors were strongly active and contracted. The abductors were overstretched, atrophied, and apparently paralyzed. The ilio-psoas was active and con-

tracted, together with the tensor femoris and sartorius. The glutei were inactive. The right knee-jerk was absent, but voluntary extension and flexion persisted at the knee. The peronei and tibalis anticus were inactive, and the foot was held in moderate equino-cavus.

The radiograph (Plate II) showed a high iliac dislocation with moderate coxa valga and practically no acetabulum, malformation of the femoral head, and marked atrophy of the shaft and right pelvis.

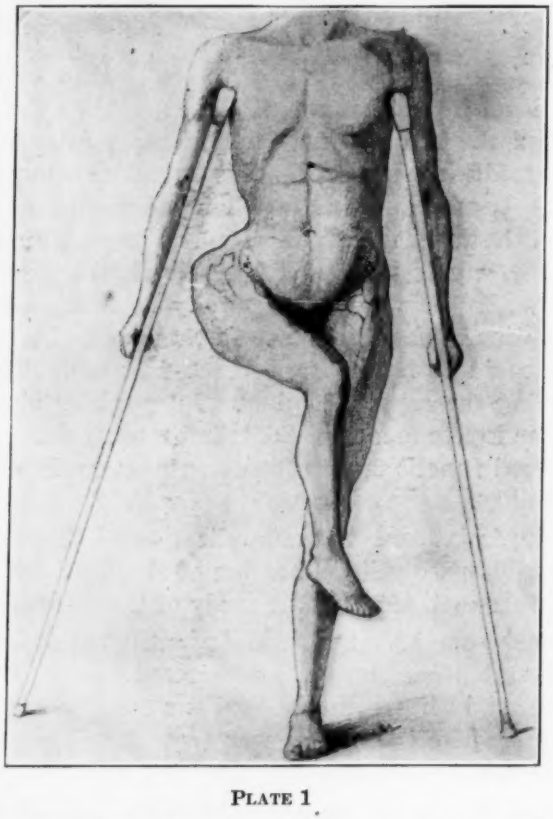


PLATE 1

Paralytic Dislocation of the Hip-Joint of 17 years duration. Note the flexion adduction deformity; the real and apparent shortening of the leg with loss of function and weight bearing.

The patient gave a history of persistently increasing deformity, futile brace support, and no attempt at weight bearing, having always been on crutches.

Diagnosis: Irreducible iliac dislocation of hip, of seventeen years duration, following infantile paralysis at eighteen months.

The factors therefore operating against reduction in this case may be classified as follows:

I. A deficient, almost absent, acetabulum.

II. A malformed distorted head of the atrophied femur.

PLATE 2

Note the deficient, almost absent acetabulum; the infantile atrophied femur with distortion of the head and coxa valga.

III. Contracted non-paralyzed muscle groups which pull the head of the femur away from the acetabulum—the ilio-psoas, adductors and flexors.

IV. An overstretched relaxed joint capsule insufficient of itself to maintain reduction if obtained.

V. Apparent shortening of the large nerves and blood vessels.

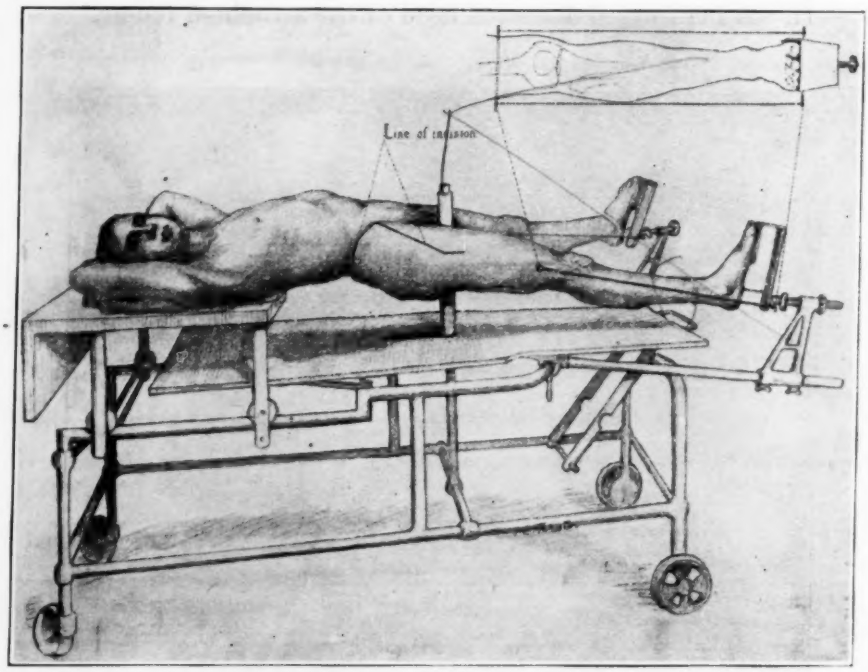


PLATE 3

Patient on Hawley table with traction obtained by Steinman nail through lower third of femur.

Hoffa maintains that it is impossible to reduce long-standing paralytic dislocations of the hip because of probable rupture of the shortened nerve trunks and blood vessels.

Schultz, quoted by Sever, made two unsuccessful attempts at reduction. In one case the neck of the atrophied femur was fractured.

Cramer reports a case—also paralyzed at eighteen months—and at twelve years the left leg was flexed, contracted, and the femur dislocated. Attempts at reduction, after cutting the contracted muscles were unsuccessful.

Rehn anchylosed the hip in a new acetabulum in a child of sixteen years.

Dollinger drove a long screw through the trochanter and neck of the femur into the bottom of what remained of the deficient acetabulum. A nut was then placed upon the internal end of the

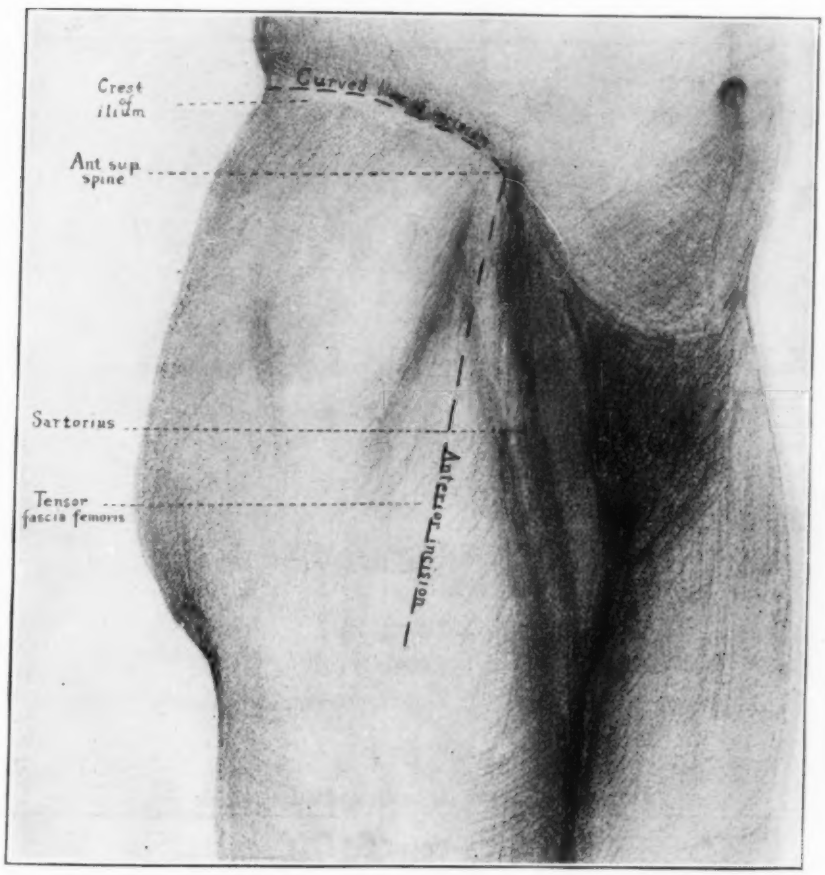


PLATE 4

Showing line of incision for sub-periosteal approach to the hip-joint.

screw by means of an abdominal incision giving access to the interior of the pelvis, and another nut was placed on the outer end. This case is reported as a good result but Vulpius naively remarks that the severity of the operation deters others from attempting it.

In view of the satisfactory results obtained by the writer in simple luxation, by Albee's method, operation was planned accordingly with several simple modifications. Since with the apparent exception of the glutei paralysis, there was excellent muscular activity in the hip, it was decided to try for a reduction *with motion and function.*

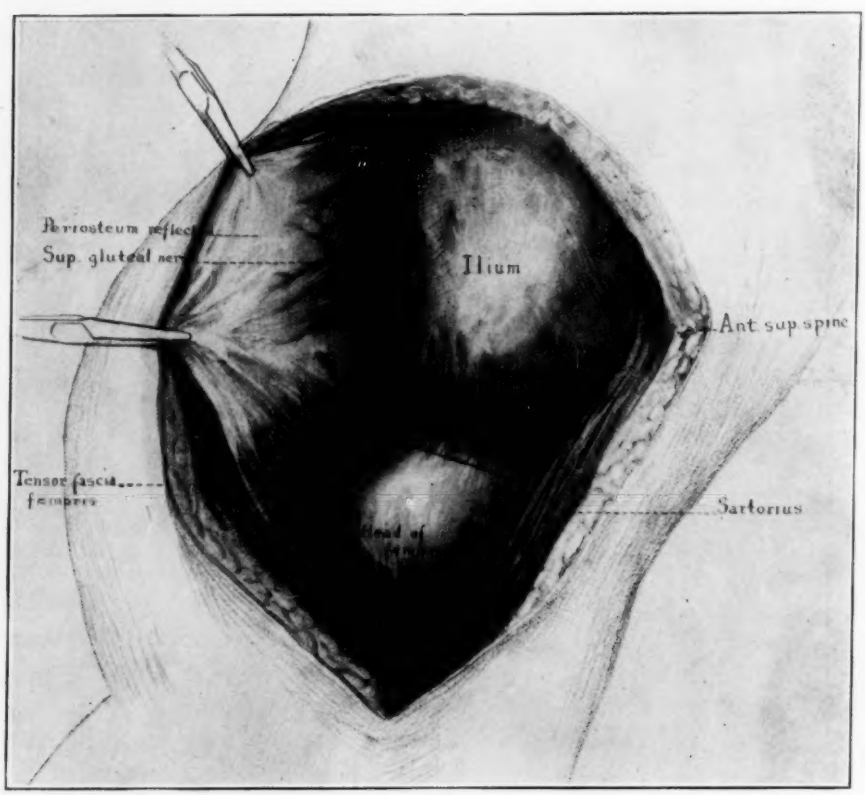


PLATE 5

The sub-periosteal reflection of the glutei with free exposure of the ilium, the superior rim of the acetabulum and capsule of the hip-joint. It is this approach of Smith-Peterson's that promises to greatly simplify the operative technique of hip-dislocations.

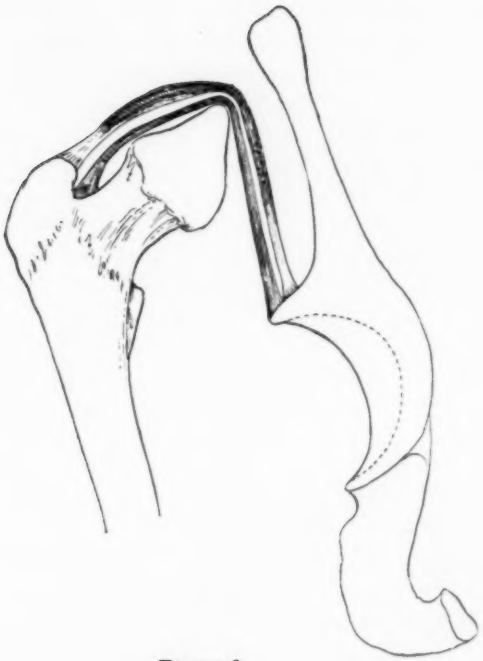


PLATE 6

Schematic drawing of a persistent paralytic dislocation. Note the overstretched atrophied capsule and trochanteric muscles, the deficient atrophied acetablum, the distorted femoral head. The dotted line indicates the approximate depth of the normal acetabulum.

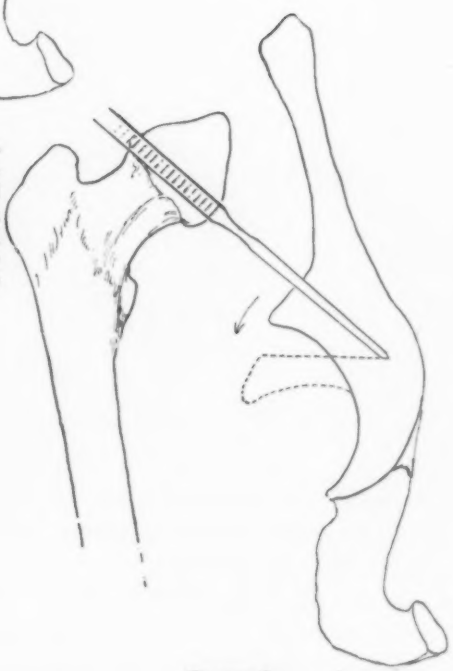


PLATE 7

Turning down a superior bony lip to form an efficient acetabular roof.

Operation August 30, 1917. Ether anesthesia. The patient was put on a Hawley table, and direct skeletal traction obtained by a Steinmann pin inserted above the condyles of the femur. Two metal chains connected the pin and the Hawley foot piece. An assistant regulated the traction at command of the operator. (Plate III.) The flexion adduction deformity was first corrected

PLATE 8

The roof turned down and a notch prepared for the tibial transplant.

by open tenotomies of the ilio-psoas and adductors, and extensor femoris. The Smith-Peterson incision gave excellent exposure of the ilium and acetabulum. (Plates IV and V.) This iliac incision was curved to three inches below the trochanter, and the trochanter was removed with a wide osteotome. The capsule was split longitudinally; the head of the femur exposed and remoulded, care being taken to remove none of the weight-bearing cartilage. The acetabulum was rudimentary and entirely filled with fat and areolar

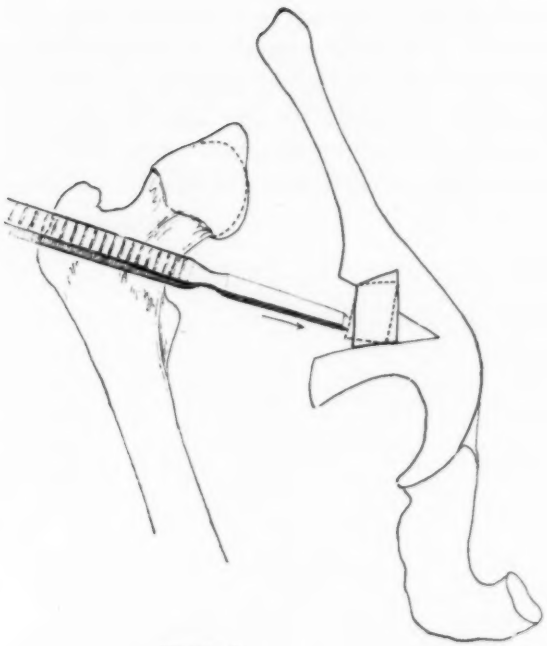


PLATE 9

The tibial transplant being forced into place. The head of the femur is remoulded.

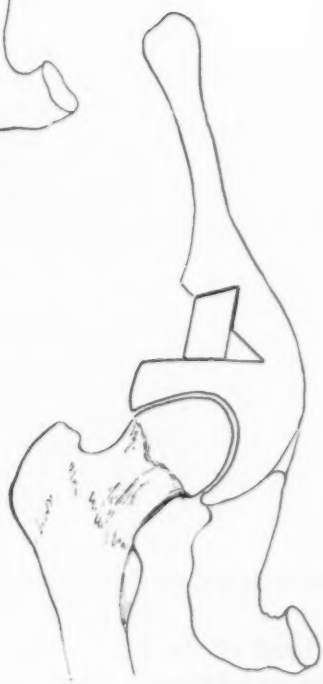


PLATE 10

The dislocation reduced and maintained by the now sufficient acetabulum.

tissue which was removed together with a thin fibrous cord the remains of the teres ligament. The joint capsule was represented by an extremely thin overstretched membrane peritoneum-like in thickness. The acetabulum barely admitted the tips of the first two fingers. (Plate VI.) Skeletal traction was very carefully obtained at intervals, and pulsation of the femoral artery watched.

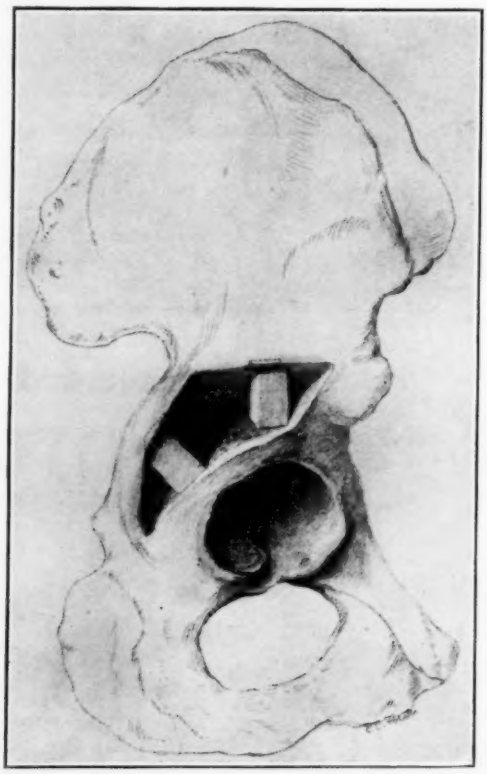


PLATE 11

Showing the position of the two tibial grafts used in the author's case.

The head of the femur was gradually brought down to the level of the acetabulum. There was no evidence whatever of circulatory disturbance although the traction seemed extreme. Traction followed by equally gradual abduction engaged the head at the edge of the acetabulum. With a chisel, a four-inch curved lip of bone

was turned down and outward approximately one inch above and behind the acetabulum, forming a curved roof about one inch in width and thickness. (Plate VII.) A tibial graft three inches long and three-quarters of an inch in width was obtained from the right tibia, and cut in half. These transplants were shaped by the motor saw, and inserted above and behind the newly-formed acetabular roof. (Plates VIII to XI.) The trochanter was replaced and held with a kangaroo suture, and the relaxed capsule reefed with two similar mattress sutures. The soft tissues were closed with chromic and catgut without drainage; the Steinmann pin was removed, and a long spica applied, from the toes to the nipple line, in thirty degrees abduction. The convalescence was uneventful. The plaster spica was changed to a short spica at the eighth week. All fixation was removed after the sixteenth week, and massage, muscle training, and active motion begun. The pa-

PLATE 12

Radiograph taken four months after operation. Note the capable acetabulum, the distinct outline of the new joint, and the position of the transplants. Compare with Radiograph in Plate 2.

tient was examined seven months after operation, and demonstrated seventy degrees of voluntary flexion. He walked with a cane and high shoe to compensate for an actual atrophic shortening of only four and one-quarter inches. (Plates XII and XIII.) September 20, 1919. Patient reports by letter—two years after operation—that he has entered agricultural college, runs a tractor, and walks without a cane. (Plate XIV.)

PLATE 13

Showing patient 7 months after operation. Dislocation reduced, firm painless weight bearing and 70° motion in hip-joint.

CONCLUSIONS.

I. In certain selected cases of so-called *irreducible* paralytic dislocations of the hip, we can give correction of deformity *with function.*

II. Hoffa's belief, based on experiments on the cadaver, that rupture of the blood vessels and nerves must occur in old long-

standing cases before surgical correction of the shortening can be obtained, does not hold true in the living.

III. Muscles in paralytic hips that are able by their contractures to perpetuate a dislocation at the hip are also able to perpetuate function if the dislocation can be reduced. Arthrodesis should not therefore be the method of choice except in flail hips.

In the preparation of this paper, the writer is especially indebted to J. W. Sever's study of "The Causes and Treatment of Paralytic Dislocations and Subluxations of the Hip-Joint," Boston Medical and Surgical Journal, Vol. CIXV, No. 9, pp. 313-323, August 31, 1911. It is the best article so far on this subject, and his bibliography and references have been freely used.

PLATE 14

Radiograph 2 years after operation. Note the well developed acetabulum, the distinct outline of the joint, and the hypertrophied femur. Compare with Plate 2.

POINTS TO BE OBSERVED IN THE FIRST TEN DAYS OF THE TREATMENT OF COMPOUND FRACTURES.

BY H. WINNETT ORR, M. D., LINCOLN, NEBR.

Presented in Abstract at the Annual Meeting of American Orthopedic Association, 1919.

There are two things to be done in the treatment of all fractures. First, to restore injured parts to their normal relationship; second, to maintain the parts in this normal relationship until healing occurs. Ultimate function must be as carefully considered as final anatomical position.

It should hardly be necessary even to mention these points much less to discuss them in detail. In an extensive experience with compound and simple fractures, however, I have found these points regularly disregarded. It may be said that there are a few surgeons who are willing to debate the importance or the necessity of observing either or both of the above rules. In general, however, the principles are accepted as true even if they are not observed in practice.

The best position we can get after any fracture and the sooner we can get it I hold to be of primary importance in securing good results be the fracture simple or compound. Also the most perfect immobilization that can be obtained after securing normal relationship of injured remaining parts is still none too good if we desire early and rapid healing.

Any argument for promoting bony union by rubbing together the ends of fractured bones is not only probably wrong in itself, but is bad teaching for practitioners whose methods of immobilization and splinting may already be inadequate.

Our military experience taught us several things about the treatment of compound fractures. We learned that by the simplification of apparatus large numbers of surgeons, even those without previous experience in fracture surgery, could be taught to do excellent work in a short time. We learned that with the Thomas Splint properly applied femur and leg fractures could be immediately adjusted and that with proper attention afterwards

the same splint could be made efficient in carrying the patient through to complete recovery.

We have long since learned the value of plaster of Paris applied by the Whitman method in cases of fracture of the neck of the femur. A proper line is established for the neck of the femur and immobilization for a sufficient length of time is maintained.

In line with the above and contrary to the impressions of the first three years of the war we found that we could send pa-

FIG. 1

Shows apparatus applied to limb, and slung by the ankle-hook of suspension-rod from a Salter's Swinging Cradle. Two or three other hooks for suspension are introduced; although sometimes useful, as affording a sense of change of position to the limb, they are not material to the apparatus.—*From "Excision of the Knee Joint," by P. H. Watson, M. D., Edinburgh. MacLachlan & Stewart, London. Robt. Hardwicke, 1867.*

The above is an apparatus of which the Balkan frame is a worthy successor. The results reported by Dr. Watson are also excellent.

tients with compound femur and leg fractures from France to the United States in plaster of Paris. Plaster of Paris proved also a great advantage even in open fractures of the upper arm and the elbow.

In this latter class of cases we had at Savenay one of our most interesting experiences. We found that a great many of our patients came directly or indirectly from the front with fractures of the humerus often involving the elbow joint. These patients came in the straight Thomas splints with elbows straight and hands pronated. We saw them from a few days to sixteen weeks

after injury. Neither normal relationship nor immobilization had been obtained in most of these cases.

Following the teaching of General Sir Robert Jones the rule was made that every such arm was to be taken out of its straight Thomas splint, the elbow flexed, the hand supinated and dorsiflexed. (Exception to supination of the hand was made in a few cases in which the patients expected to be employed later with the hand palm downward upon a table.)

After such manipulations the arm was fixed in plaster of Paris, many times with a body cast, or carefully bandaged into a Jones humerus traction splint or an aeroplane splint. In some cases where there were especially large wounds the patient was put to bed and the arm suspended by the humerus hammock with the arm flexed and hand extended in a Balkan frame as taught by Col. Joseph A. Blake in Paris.

One of the points which it is desired to clear up in this connection is the distinction between the use of weights and pulleys purely for suspension in the Balkan frame and their use as a means of securing traction. In our work at Savenay weights and pulleys were rarely used for traction. They were often used, however, in the Balkan frame for arm and leg suspension or as an aid to the patient in lifting himself from the bed for surgical dressing and other purposes.

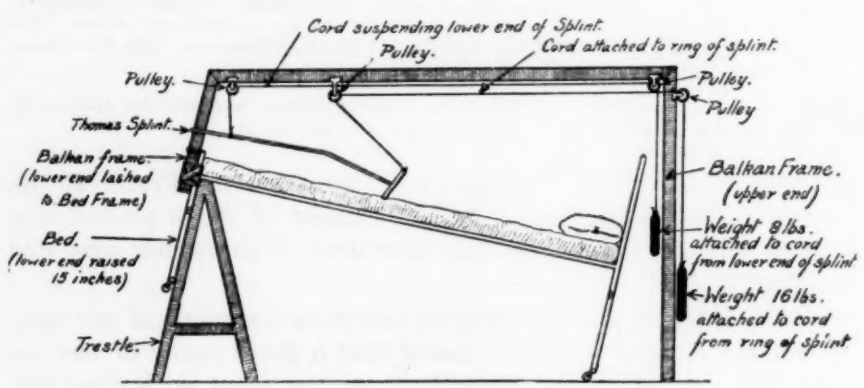

Cord suspending lower end of Splint.
Pulley.
Cord attached to ring of splint.
Pulley.
Pulley.
Pulley
Thomas Splint.
Balkan frame. (lower end lashed to Bed Frame)
Bed. (lower end raised 15 inches)
Trestle.
Balkan Frame. (upper end)
Weight 8 lbs. attached to cord from lower end of splint
Weight 16 lbs. attached to cord from ring of splint

FIG. 2

From Statistical Report (British) No. 2 1918, Medical Research Committee, Method of Major M. Sinclair, R. A. M. C.

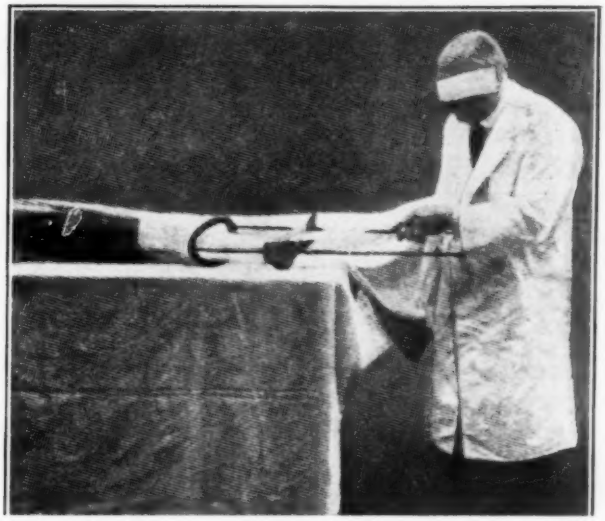


FIG. 3

Introducing limb through ring of knee splint.

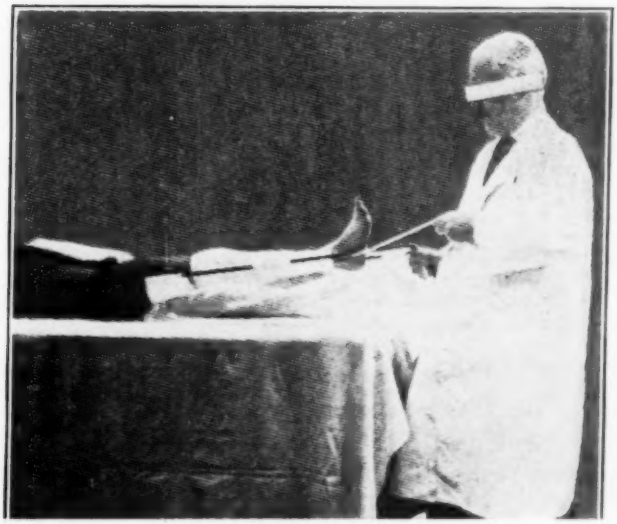


Fig. 4

Method of application of the Thomas splint. Knee splint in position, traction applied.

From "The Mechanical Treatment of Compound and Suppurating Fractures Occurring at the Seat of War. By General Sir Robert Jones.

Any amount of traction necessary whether for femurs or other portions of the body can be obtained by the proper use of the Thomas splint. As pointed out on one or two previous occasions we were able even up to sixteen weeks in some cases entirely to overcome a shortening of two and one-half inches in compound femur fractures by the use of the Thomas splint according to the technic laid down by the British. This technic as employed at Savenay was described in detail in a circular issued at Savenay in 1918 and since published in this country.*

What the writer hopes is that our American surgeons and especially our American general practitioners, will discontinue the use of methods which have to commend them only the fact that they have been used successfully by a few surgeons who became skillful in a particular method. All others should unite upon methods which have been shown to be universally applicable.

The treatment of fractures is a sufficiently difficult undertaking when done the easiest way. There are plenty of instances to show that only a few surgeons regularly succeed in getting good results with some of the "personal" methods now in vogue. In the hands of a few men Hodgen splints, the Ruth Maxwell method,

---

*The Thomas splint should be applied and cared for always in the same manner. The introduction of individual methods invariably leads to a loss of efficiency, as patients pass from the hands of one surgeon or hospital to another. The following points must be observed. A long splint and a well-fitting ring must be selected. It must be bent to an angle of 10 to 15 degrees at a point 1.5 inches above the level of the knee-joint. Having regard for wounds, the adhesive traction bands (of Sinclair glue or moleskin plaster) must include as much skin of the leg and thigh and extend as high as possible. The traction ropes for twisting attached to the lower end of the adhesive should be of 0.25 inch rope or of 4 ply muslin, fastened very securely into the adhesive, so that it will not give away under a pull of even 15 to 20 pounds. Muslin hammocks of not more 4 inches in width should be placed across the splint for its entire length at a sufficient tension so that the leg rides well on the top of the splint. The splint is then put on and the traction straps tied firmly over the lower end with the ring tight against the tuberosity of the ischium. A right angle foot piece is put on and the foot and knee bandaged in such a way as to put the entire extremity at rest in the splint. The twisting of the traction bands should have attention once or twice daily. The lower end of the splint should be tied to the outer end of the foot of the bed in such a position that the lower end of the femur rotates slightly outward. The foot of the bed should be raised 12 inches so that the patient's body acts as a counterweight to pull against the anchored splint. By following exactly this technique it has been possible at Savenay to demonstrate an average gain in length of more than 3 centimeters in a series of over 300 cases. In dealing with open wounds in this splint, it is only necessary to release one or two of the 4-inch hammocks. Care must be taken so that the entire area of the fracture is not moved or allowed to sag below the level of the normal anterior curve of the femur.—*From Surgery, Gynecology and Obstetrics*, November, 1919.

the Buck's Extension method and even weights and pulleys with long sand bags have given good results.

In the hands of the man who is using any of these methods for the first time, however, or who has occasion to use them only once a year we know how poor the results can be. Anyone can be taught to use the Thomas splint properly and to apply it to all kinds of cases within a few hours or in an experience of a few cases. It adapts itself even to home care without much difficulty.

It is greatly to be hoped that the four or five standard splints which were used throughout the A. E. F. will come to be generally used in this country and that most of the other methods and forms of apparatus will be entirely discontinued. Even the individual modifications of these standard splints usually detract from rather than add to the serviceableness of the apparatus.

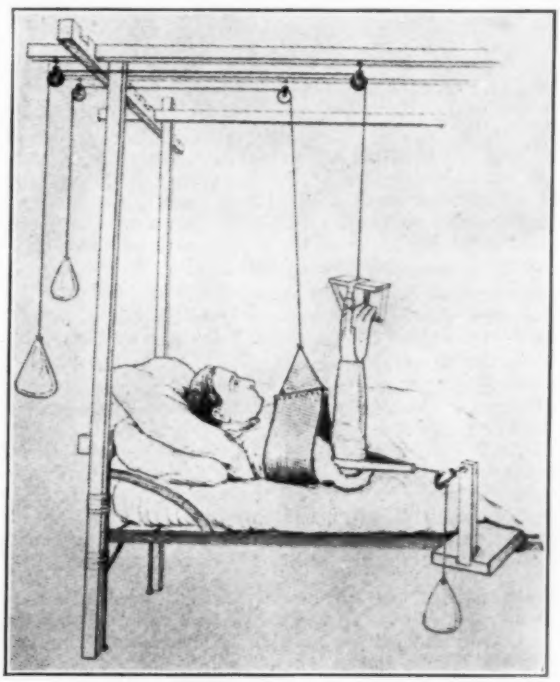


Fig. 5

To illustrate a simple method of obtaining abduction and traction by means of a rough board slipped between mattress and bedspring and holding by friction.—*From "The Treatment of Fractures by Suspension and Traction. Surg., Gyn. and Obstet., Mar., 1918, by Dr. Jos. A. Blake and Dr. K. Bulkley.*

Discussion.

Dr. John Ridlon of Chicago said that the first Thomas hip splint made in this country was made by him in his cellar. They were used afterwards at St. Luke's Hospital, New York. He felt sorry that the Thomas splint as used in the army was not exactly the splint devised by Thomas, and recommended by Jones. Dr. Ridlon said that he had seen 2½ inches of communited femur involving the great trochanter, and an oblique fracture in the middle of the shaft, with overlapping, and yet after proper use of the Thomas splint the leg was as long as the other.

He demonstrated a loop used with the Thomas splint, passing over the shoe for traction and around the ankle. The hitch is made by forming a loop with a piece of bandage, and then drawing a second loop from one end of the bandage through the first loop. The first loop is placed around the ankle; the second loop goes under the arch of the foot. This hitch was not described in the splint manuals, and is more quickly made than any other.

Dr. Ridlon said he would like to ask the men from overseas if they had found it possible to elongate fracture of the femur during the first two weeks of the healing process. Could the connective tissue be stretched in the same way as granulation tissue which goes with healing of wounds, such as burns. He had heard this had been done in France. It would seem an important question.

Dr. Joel E. Goldthwait of Boston said there was no question as to the feeling of efficiency represented by the Thomas splint with the American Expeditionary Forces, and this feeling was shared very much by the other armies, especially the British.

At a meeting of the Medical Officers of the American Expeditionary Forces held in Paris under the auspices of the American Red Cross, a demonstration of the Thomas splint was made, and at this meeting the director of the British Forces was present and shared in the discussion. He stated that this one splint had undoubtedly saved more lives than any one piece of apparatus, and that in their Army they had begun to call it the "St. Thomas" splint.

Various modifications have been suggested, but they have been discouraged quite largely because while the Thomas splint itself is almost fool proof in its application, the modifications all practically involve special understanding.

In the use of the Thomas splint it should be remembered that while it is relatively possible to get lateral alignment in the cases of fractured femur, that there is a tendency for the upper fragment to drop downward so that the normal anterior curve of the femur is lost. By adjusting the pads under the seat of the fracture, it is possible to raise the fragments and correct this feature. It should also be remembered in putting up a fractured femur that the upper fragment always drops downward, and consequently rotates outwardly slightly. For that reason the lower fragment with the foot and leg should be put up with the lower leg rotated outwardly somewhat so that the toe instead of pointing straight up will point outwardly about 20 degrees.

Dr. A. H. Cilley of New York said that if one wanted to get elongation with the Thomas splint or anything else, one had to have a man working twenty-five hours a day. We had such a man in Lt. Davis at Savenay, but he did not know many men who could do it.

Dr. R. R. Fitch, Rochester, N. Y.: One should make an attempt to turn compound fractures into simple fractures. It is not possible to do this unless the cases are seen early. Primary suture may sometimes be done but secondary suture is usually preferable.

The condition of the wound should be checked up by laboratory findings, the bacterial count being not as important as the information obtained by

cultures. When the wound is free from anaerobic bacteria and streptococci, it may be safely closed even though there are a few staphylococci present.

DR. ROBERT OSGOOD of Boston said that he confessed to ignorance of the proper use of the Hodgen splint when it was illustrated in the manual of splints and appliances for the Medical Department of the U. S. Army. High oblique suspension was the keynote of its use and traction was thus obtained. Many men had objected to the Thomas splint because they found that it caused pressure on the ischial tuberosity. It is possible to remove this objection. The first point is that the ring must be smooth and covered with leather. A splint covered with hose pipe and padded with cotton makes it impossible to maintain continuous counter extension. The ring must be covered with leather well soaped and absolutely smooth. The acute pressure point may not be more than the size of a ten-cent piece. If you can change that pressure often, you can make the patient comfortable, and avoid sloughs by moving the leg, for example 6 inches to the right in the morning, and 6 inches to the left at night. Movement through an arc of a few degrees will largely avoid pain and pressure. With some sensitive skins these slight changes are not enough to relieve pressure, but if in addition to that a 5-pound weight is attached to the end of the splint and suspended over a pulley at the end of the bed, the pressure is removed a fraction of an inch from the tuberosity. Proper technic and familiarity with its use will, he believed, remove objections to the use of the Thomas splint.

DR. OSGOOD said it was a difficult thing to measure femora, especially with osteomyelitis, a heavy dressing and with a Thomas splint in place. To keep track of femora with dressing on, a simple device was worked out. A yard stick with a piece of sheet steel 4 inches by ½ inch screwed at right angles to one end and with a similar piece on a sliding arm was used. The fixed end was hooked over the anterior superior spine, and by sliding the arm along to the malleolus one could measure the limb over the dressings and splint.

INSTRUMENT FOR TENDON FIXATION

BY G. E. BENNETT, M. D. 4 E. MADISON ST., BALTIMORE, MD.

Feeling that a firm implantation of a transferred tendon was a very essential point of technique and that we might accomplish this by the simplest possible method, this instrument has been designed. It has been given the nick-name of the "button-hook" on account of its shape which is almost identical with that useful article.

The hooks are made in three sizes, diameter of the hook section being one-half, five-eighths and seven-eighths inches respec-

tively, the total length of the instrument eight inches. It has a cutting edge and an eyelet large enough to accommodate the tendon as shown in the accompanying cut. With this one is able to drive the sharp point through ligaments and into osseus structures and by carrying the handle in an arc bring the point out through the tissues, insert the tendon through the eyelet and draw it through bone and ligaments so that it can be re-attached to itself or firmly to the tissues at the exit of the tendon.

THE ORTHOPEDIC LABORATORY AS A SOLUTION OF THE BRACE PROBLEM.

BY DR. J. E. M. THOMSON, LINCOLN, NEBRASKA.

One of the problems confronting the orthopedic surgeon, especially in the smaller cities, is that of obtaining adequate orthopedic appliances and braces that seem to meet his particular needs; also the delay involved and the tedious multiplicity of appointments necessary before an order can be satisfactorily filled. At one appointment he must measure his patient or make the required casts, then send to another city for the desired appliance, waiting several days or weeks for its arrival. At a second appointment the brace is applied. If alterations are necessary the brace must be returned and a third appointment made. These frequent professional visits, especially when made from a distance, often cause dissatisfaction to the patient and embarrassment to the surgeon.

Prior to entering the army, my only effort to gratify my desires in regard to adequate braces lay in the use of removable plaster jackets and pelvic casts in vertebral and sacroiliac disorders, and certain shoe alterations for foot conditions. However, at the time the base hospital in France—to which I was attached as orthopedic surgeon—began receiving patients, it was practically impossible to procure splints from the local supply depot. Therefore it became necessary to buy on the open market, in neighboring French towns, equipment for a workshop or, as I designated it, an "orthopedic laboratory." Here, with a full-time man in charge, were made not only numerous splints, of the ordinary type prescribed by the U. S. A. Orthopedic Council, but many other braces and appliances which seemed to meet the local needs most advantageously. In fact, with the exception of a few Thomas leg and arm splints, we did not find it necessary to call on the medical supply depot for any brace materials.

It was this experience which led me to believe that to practice the art of orthopedic surgery successfully it is necessary to have a "personally conducted" or supervised laboratory where the surgeon can display his own eccentricities, good or bad, and where adequate, rapid and efficient service can be rendered to the patients. To a certain extent, of course, the exception to this rule lies in the

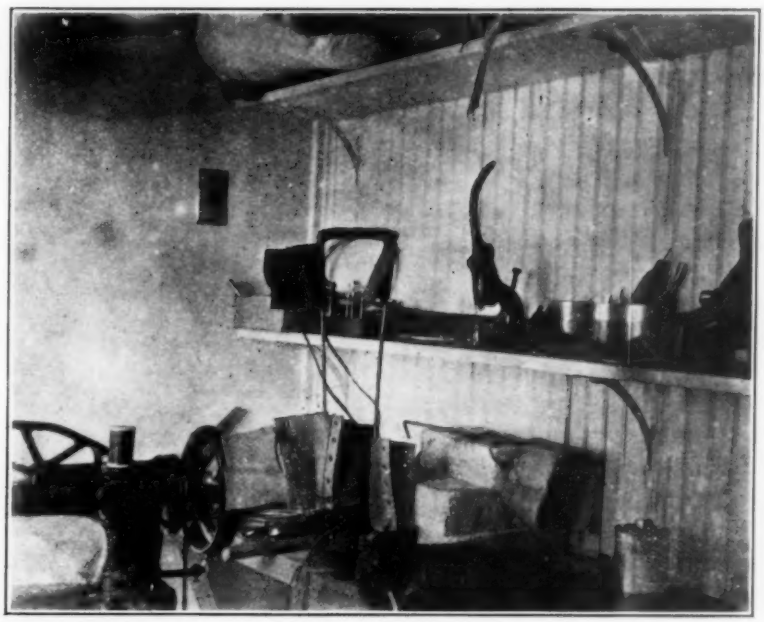
opportunities presented to surgeons in large cities, where the commercial brace-maker is almost a part of *his* orthopedist's own machine.

It is a real satisfaction, therefore, to have on my return to private practice an orthopedic laboratory in connection with my office. Such a venture, in modest form, is not beyond the reach of anyone. The initial expense of equipment and upkeep is totally

Due to the small space illustrations are very difficult to obtain. However this corner shows the end of the polisher and the power drill driven by the same motor. Also the oxyascetyline welder and boot jack.

overbalanced by the benefits derived. Lack of space has made it necessary to confine my own department to an area six by nine and one-half feet, in one end of my plaster room, and separated from it by a seven-foot partition. As the window at the laboratory end is large and the light excellent, the half-partition does not interfere with the adaptability of the plaster room (nine and one-half by twelve feet) for all ordinary office plaster work, nor with its light and ventilation.

The equipment includes a pair of work benches running the length of the room on either side. On the one is an ordinary power polisher and finisher such as may be seen in any up-to-date shoe repair shop; and from the same motor (one-third horsepower) is operated a light drill. The opposite bench, with shelves above and vises attached, is used for all work purposes. At one end is a cabinet for the storing of materials; at the other a boot-jack and leather stitching machine.



Another corner of the shop, showing work bench and leather stitching machine.

The latest and one of the most helpful requisites of such a labratory is an oxyacetylene welder, with which both bending and welding can be done with ease and safety. The above, with the various small accessory tools, embrace practically all that is necessary to the manufacture of almost any simple brace.

The work of the laboratory is performed by myself and an assistant. It is our intention to furnish prompt service, and whenever possible, day service. By this I mean that measurements are taken, fittings made and braces completed on the day when patient presents himself for measurement. We make no attempt to gratify

the aesthetic temperament by elaborate and glittering contrivances. On the other hand, every effort is made to simplify the apparatus and to turn out braces that are well fitting, comfortable, durable and neat, either enameled or leather covered.

The following constitutes the full list and cost of equipment:

1 Progressive polisher and leather polisher, with ⅓ horse-power electric motor	$100.00
1 Bench power drill	20.00
1 Progressive boot jack	12.00
1 Leather stitching machine, Singer	95.00
1 Universal oxyacetelyne welding outfit (complete)	49.50
1 Vise with anvil end	6.00
1 Universal eyelet set	2.50
2 Leather punches at $1.00	2.00
1 Cobbler's hammer	.60
3 Leather knives at 25c	.75
Awls and needles, assorted	.50
3 Nail nippers at $1.00	3.00
1 Mechanic's hammer	1.50
3 Files at 25c	.75
1 pair pliers	1.50
1 Pair tin shears	2.50
1 Hack saw and blades	2.00
4 Steel drill points	1.00
	$301.05

With the above list of equipment, which demands an expenditure of only about $300.00, can be manufactured all manner of spine, leg and arm braces and splints, as well as other orthopedic appliances.

Cold rolled round steel shafting is used, and is preferred for arm and leg apparatus, such as the Thomas and other arm and leg splints and braces of the calliper or side iron variety, the size of the bar depending upon the length of the splint and the stress brought to bear. One-fourth and five-sixteenths inch diameter generally meet most of the requirements. For cuffs and retaining elements galvanized iron is used. In the manufacture of spine and sacro-iliac braces, strap iron of various widths (½ to 1½ inches) and thickness (1/16 to ⅛ inch) is used for the less flexible sup-

porting portions, and galvanized iron and sheet iron are used where flexibility is desired. For padding, ordinary harness felt is used, neatly covered with leather. On certain back braces we use an inner facing of fine white or tan felt, stitched to an outer leather covering. Our experience has been that the best and strongest leather is always the cheapest, and that closely placed lacings are always preferable to buckles and straps. Most of our leg and arm apparatus is successfully made from measurements, but a plaster of Paris torso is practically essential for all body braces.

Though my laboratory "technician," as well as myself, are but novices in this work, we have learned to turn out wearable and adequate splints and braces at a relatively low cost, making the laboratory not only a paying proposition but a valuable asset to my orthopedic practice.

SOME POST-WAR ORTHOPAEDIC PROBLEMS

BY E. MUIRHEAD LITTLE, F. R. C. S., LONDON.

Presidential Address to the British Orthopaedic Association, November, 1919.

GENTLEMEN:

When I last year had the honour to address you the country was still at war and the great advance which ended in the armistice had not begun, nor was it even hoped for so soon by most of us.

The difficulties of a state of war were great but they were simpler than the difficulties and the problems of peace. We are now but little concerned with the treatment of recent gun-shot injuries but for years to come we shall have to treat the injured and crippled pensioner, and the remote results of wounds and disease incurred in or near the fields of battle. It will be the duty of the members of our association to continue to lead surgical opinion in these matters.

How far the methods found useful in the treatment of recent war injuries are applicable to the surgery of peace is a question which will require consideration. For instance in the treatment of compound gun-shot fractures of the long bones in the Special Surgical Hospitals it has been found generally possible with the improved methods at our disposal, to do away with all shortening not due to actual loss of bone. I have been told that in some cases the limb has even been unduly lengthened by traction. It is probable that the extensive damage to muscles which is so common in gun-shot injuries is the factor which has facilitated these results. Will equally good results be possible in the treatment of fractures in civil life by similar methods?

This is a question which will have to be answered by orthopaedic surgeons, so that the conditions governing success and failure may be properly estimated and in case of failure to attain ideal results the reputation of civilian surgery may not be unjustly tarnished.

For years to come the stumps of the survivors; of some fifty thousand wearers of artificial limbs will offer cases for treatment; and if the operations introduced by Vanghetti and the special pros-

theses for them prove of practical value there will be a host of operations necessary to kinematise many of these stumps.

It is to be hoped that the discussion which is presently to take place will throw light on the possibilities of the method.

The problems involved in the operative treatment of the disabilities resulting from Spastic Paralysis need discussion and elucidation. The hopes entertained when posterior rhizotomy was first adopted as a means of treatment have scarcely been fulfilled, and other proceedings seem to offer better results.

Here again we may hope this morning for light and leading in Mr. Bankarts' paper and the discussion thereon.

We do not know how many cripples there are in this country and it is most desirable that a census should be undertaken comparable to that made in Germany and reported by Biesalski before the war. It is almost certain that a large number of cripples have hitherto failed to receive effective orthopaedic treatment, and it appears quite certain that with the assumption by the government of greater responsibility for the Public Health, there will be an increase in the facilities for treatment throughout the country and a corresponding increase in the number of surgeons interested in orthopaedic surgery, all of whom should be members of our Association.

I have touched on a few of the orthopaedic problems of peace, but there are still others and no orthopaedic Alexander need sigh for new fields of conquest for a long time to come.

DISCUSSION ON CINEPLASTIC AMPUTATIONS
BRITISH ORTHOPAEDIC ASSOCIATION

November, 1919

OPENING REMARKS BY THE PRESIDENT, MR. E. MUIRHEAD LITTLE.

When in 1896 the Italian dream of African conquest melted away in the disastrous conflict with the Abyssinians at Adowa, a number of the mutilated victims of the brutality of the victors reached Italy.

For although the Abyssinians like the Boches profess and call themselves Christians they treated their enemy wounded with horrible barbarity.

Eviration, i. e., amputation of the external genitals was carried out on numbers of prisoners together with amputation of the hand or hands.

When the survivors of these unfortunates reached Italy, their condition naturally excited widespread pity. For the evirated no prosthesis was applicable but surgical and mechanical attention was directed to the provision of artificial limbs for those who had lost hands or feet. In 1898 Dr. Guiliano Vanghetti of Empoli in Tuscany, then a general practitioner, conceived the idea of so modifying the stump by operative measures, as to enable its intrinsic muscles to be harnessed to a prosthesis and thus to activitate the artificial segment.

Former methods of producing movements in artificial hands and fingers depended upon efforts made by the upper arms and shoulders; this principle appears to have been first used by Bailif in the middle of the last century and an elaborate example of the method is to be seen in the Carnes' arm.

Dr. Vanghetti is not a surgeon and he had no opportunity of putting the suggestions of his fertile brain into practice, but he performed many experiments upon fowls and during the last twenty years his writings have stimulated surgeons to put his principles into practice. To all such procedures he applied the term "Cinematization" or cinematic plastic. His suggestions were disregarded for years, for in 1907 Basetta writing in the Revue D'Orthopedie could only cite two cases of operation, but there were

then not less than twenty suggested ways of making plastic motors of tendons. I will not go into the details of the various methods proposed or practised, but refer you to the reports of Professor Putti's lecture in the British Medical Journal and the Lancet of June 8th, 1918, and to the articles by Vanghetti himself, by Stassen, Pellegrini and Pieri in the Archives Medicales Belges, No. 71, p. 657, of 1918.

These four articles give a good account of the whole subject. An illustrated abstract of them appeared in the Medical Supplement of the Daily Review of the Foreign Press issued by the General Staff, War Office, and on sale at H. M. Stationery Office, No. 10, of Vol. I, of October 1st, 1918. These various kinds of motors may be roughly divided into two classes, the Club and the Loop. In the former class are all those motors which are meant to be connected with the prosthesis by their peripheries while in the Loop class are all those which are connected by their inner and more central surfaces, such as the loop (in Italian Ansa, which means a jughandle), the tunnel and such like. We shall see this morning good examples of both these classes.

The Club motor consists of one or more tendons or tendinous expansions, if possible together with a portion of its bony attachment, surrounded by a sleeve of sound skin. A ring is loosely clamped round the neck of this club to which the cord or other connection with the prosthesis is attached.

In the loop type on the other hand a rod or cord is passed through a skin lined opening, in muscle or tendon or else as in the case of the jug-handle form a divided ring is clamped on to the skin covered tendon. Some of these jughandled motors consist of the tendons of the two muscles which are united together to form a loop, much as if two club motors without bone were joined together end to end.

It is asserted that besides acting together in one pull, their alternating action can be used by means of two clamps. I have great doubt of the efficacy of this arrangement, which I have not yet seen in action. Doubtless some of our members who have lately been to Italy will be able to enlighten us on this and other points.

So far as my limited experience goes, the club motor with osseous nodule in its end gives the greatest promise of usefulness.

If it is made large enough and with a large nodule of bone it is better fitted to stand the pressure of the attachment than is the tunnel and it can be so planned as to provide a large excursion or range of movement more easily than the tunnel. Also it can be placed at the end of the stump, a position more advantageous than that of the tunnel which has to be lateral.

The desiderata in a plastic motor are the following:

1. Sufficient muscular power.
2. Well nourished and innervated skin covering.
3. Ample range of movement.
4. Size—sufficient length and thickness.
5. Appropriate surface for counterpressure covered with well nourished and resistant skin.

This last condition is important. Unless a surface is available, the patient's efforts may expend themselves in simply pulling the socket of the prosthesis further on to the stump. Such counterpressure may be exerted against the end of the bone of the stump or against the sides of the wider upper part of the stump as in the forearm.

The range of movement in the upper extremity should be at least one inch, an inch and a half or two inches is preferable. If the range is small the difficulties of fitting are increased, for with a small range with loose fitting there is a danger of all the effort being expended in overcoming the back-lash. Again if the range is small only short leverage can be used and the effort must be greater.

In the case of two motors, being employed for two opposed movements, for instance, the one for extension and the other for flexion of the fingers, the range of movement in the two should be nearly the same, but a difference of range can be accommodated by varying the leverage for the two movements.

It is, I think, easier to get a good range of movement with a club than with a tunnel, because the extremity of the club is free while the distal side of a tunnel is apt to be bound down. This is specially likely if the tunnel is in tendon.

Sauerbruch, who is an enthusiastic tuneller, prefers to make it through the muscular substance. I have seen tunnels so tightly bound down, that the amount of movement was too little to be of

any use. I have, however, seen other tunnels with ample range of movement.

The amputation sites suitable for cinematisation are first, those so close to the point that the segment below the articualtion is of no use to work a socket. By re-amputating through the bone above the joint the patient's condition is no worse off, even if the cinematisation is a failure and the skin of the reamputated part is available for covering the motors, while the bones are utilized to form end nodules. Secondly stumps that are too long, after amputation through joints as at the wrist, can well afford to lose an inch or two to make plastic motors.

I think that so far most of the cases operated upon in this country fall into these two categories. But when the practical value of the procedure and particularly of the appropriate prostheses is established there will probably be few stumps that may not be improved in usefulness by the operation. There is less room for it in the lower extremity than the upper, because the functions of the leg and foot are simple compared with those of the arm and hand, and they are far more successfully imitated by existing prostheses.

In the upper extremity it seems probable that it will be best to limit the number of motors to two—extensor and flexor—a third motor designed for supination has been added, but there are difficulties in adapting prostheses for more than two motors, which, however, may be soon overcome.

When two motors are provided, say above the elbow, the question arises of how best to use them. Should one be used to move the elbow and the other to flex or extend the fingers against the opposition of a spring, or should the elbow be worked by one of the older methods, and the motors be used in antagonism to one another as flexors or extensors of the digits? Theoretically the latter method recommends itself to me, because it seems probable that with use the muscular sense may be so far developed, that a co-ordination replacing to some extent the sense of touch may be acquired. If the cinematisation hand is to acquire any delicacy of grasp it seems clear that the spring action must be avoided.

There have been few cases reported in this country. Mr. Eric Pearce Gould reported two in the British Medical Journal, p. 277, 1916. One of them, an officer, was sent to us at Roehampton to be

fitted. He had an amputation of the lower third of the upper arm and one club motor without bone nodule, connected with the flexors of the elbow.

He wore a clamp on the neck of this motor and an exercising splint with elastic resistance for nearly three months without any trouble, although the end of the club was cyanosed. Immediately after the artificial hand was fitted he left well satisfied, for South Africa, and we have not heard of him since. Major Fitzmaurice-Kelly has operated upon a number of cases, and published a paper on his experiences in the Lancet of August 16, 1919. Numerous cases have, it is said, been operated upon by other surgeons, some of whom will give us the benefit of their experiences.

DISCUSSION.

MR. S. ALWYN SMITH (Cardiff): My experience in this method of prosthesis dates from the time when the Italian moving pictures were sent round this country showing the results of the different types of operation and their fitment with various appliances. The somewhat wonderful results had the effect of my office in the hospital being besieged the next morning by all the limbless cases who wished to undergo operation at once. My difficulty was to avoid operating indiscriminately on them all and as I am responsible in South Wales, not only for preliminary treatment, but also for the final fitting, and as I am likewise responsible for repairs, I did not feel inclined to be stampeded into doing a lot of work which might reflect upon myself in time to come.

Therefore I agreed with Sir John Lynn-Thomas that I would do a few cases on the peg motor principle. This I thought preferable to canalisation. I did not intend to do any further series of cases until I saw that the first ones had been satisfactorily fitted with arms and that the results were fully satisfactory not only surgically, but also mechanically, that is from the standpoint of work done by the limb maker. More important than all I wished to see that the cases were satisfactory industrially as this is very necessary in such a district as South Wales. It must be remembered that the majority of our cases are colliers who have earned high wages before the war in that type of skilled labour, and that they will not enter sedentary occupations as limbless cases unless they can help it. We have found by experience that they prefer to go into some kind of above-ground colliery work at which there are fairly high wages without anything which could be called intellectual strain.

I had nothing to go on at that time with regard to operative procedure, and the Putti type of artificial arms had not yet come to this country. Sir Robert Jones had a set sent him at a later date and he kindly lent them to us afterwards. I have brought them here to show you.

The first case I did on the peg motor principle was a long above elbow stump, in which I saw that even if I failed in my operation he could be satisfactorily fitted with a working arm—the amount of shortening that I should be likely to produce not being sufficient to prevent a satisfactory fitting by the old method. The method I adopted was this. I cut long antero posterior flaps of over three inches. The flaps were turned up and the main vessels and nerves were tied off above *that* (demonstration) level. The lateral points of skin where anterior and posterior flaps met had to be brought across to meet in the mid line over the end of the bone. The bone was cut through at a suitable level so that the skin could be brought across without tension. I then covered over

the end of the bone with a muscle and fat flap as I did not want the skin to adhere to the end of the bone or to slough owing to undue tension. A stitch was taken through the skin from side to side at the highest lateral points of the incision and the skin coated over the end of the bone in the middle line. This now caused each flap to become concave on its deep surface.

The brachialis anticus and biceps tendons were scraped and the former wrapped round the latter and sutured to each other. The ends were turned over during the stitching to make a hump at the end. I now carefully stitched the conjoint tendons to the deep fascia of the flap and stitched the skin edges together to cover the tendons in. I did the same thing to the triceps on the other side. When the operation was finished the suture ran in a straight line antero posteriorly up the posterior aspect of the flexor peg—across the end of the bone and down the anterior aspect of the extensor peg. On the sixth day I wrapped sterile worsted fairly tightly round the upper end of each to make a constriction and this was continued until it was substituted by the metal collar.

A serous exudate came away for about a fortnight, after which the wound finally healed and the collars were applied and constantly worn. We then started exercise against resistance by means of a light plaster of paris bucket with wire struts incorporated, the resistance being furnished by elastic bands. This served the double purpose of exercising the pegs and also extending them to prevent any tendency to recession. At the end of six weeks the man could lift ten pounds with either peg and the amount of thrust in the flexor motor was 1½ inches and ¾ inch in the extensor one. This patient has lifted seventeen pounds repeatedly with the flexor peg without pain or discomfort by the collar.

The next man I did was a forearm case. There by the same method I took the flexor carpi radialis and the flexor profundus digitorum on the one side and the two primary extensors of the wrist and the extensor communis on the other side.

In both cases the flexor peg has a larger range of movement than the extensor and this opens up a difficulty as the President has pointed out. When the flexor peg contracts it pulls on a non-elastic cord which actuates the artificial fingers through a cam or helical gear and the extensor peg is extended and vice versa. This tends to impede the efficiency of the activating peg. The problem can probably be solved mechanically.

Now we come to the tragedy of the situation as far as it affects my cases—one has been cinematised twelve months and the other eight months and neither have been finally fitted yet. One limb maker—on the approved list—tried it but the result was very cumbersome, weighty and inefficient. This man has been away home for several months—tired of waiting, and has not worn his collars regularly with the result that the zone constriction—the neck—has disappeared and we shall have to work again to get it back.

The strength of the pegs is not impaired as you will see. He had a 1½ inch thrust the last time I saw him but he cannot be fitted at present because he cannot keep the collars on the pegs securely.

I am afraid I cannot say much at present as regards the results from the mechanical standpoint. You will see Mr. Hobbs' representative here and he will fit up the arms now so that you may judge to what extent he has succeeded. I only saw the cases last Wednesday for the first time for some months—the result of the delays in fitting—but it was promised that the arms should be ready today.

There is the important question for consideration as to which is the preferable method—canalisation versus peg motors. I cannot say much on that point practically as I have done no canalisation work. The method never appealed to me as being so surgically or mechanically sound as the other.

Major Brook of Swansea has done three cases all of which came into my hands for fitting and which I show you. The same delay has occurred in these cases as in my own. One of these cases, a single canal in the biceps, has done

very well, it is very strong and has a 1½ inch thrust. The other cases I show you have failed, partially on account of scar tissue binding down the canals. This one has only ½ inch thrust in the flexor tunnel and barely any movement in the extensor one. So from the surgical standpoint I cannot say whether one is preferable to the other.

Ithink with the President that neither should be used in the lower extremity. The results of fitting mechanical legs is I think universally satisfactory and from what I could judge from the Italian films the cases did not walk better than ours in Cardiff. As far as the arm is concerned I am convinced that there is a future for it and I have a lot of cases down for operation if I can see that they will be satisfactorily fitted.

With regard to surgical, mechanical, and industrial efficiency, on the first will devolve as to whether peg motors are preferable to canalisation or not. The second will depend on British surgical instrument makers, which with all due deference to those on the approved list have been very disappointing to me up to the present. The work is only in the experimental stage and I do not think we are justified in doing cinematic work indiscriminately until the limb makers are educated up to the required standard, otherwise the method will fall into disrepute.

From the industrial standpoint I will show you specimens of the Putti arms that came from Italy. None of them are of any use industrially, to my way of thinking, as they are so lightly made. Here is the type for a single peg motor, working against a spring, the motor flexing the fingers against the spring resistance which at rest keeps the fingers extended and the thumb abducted. The limb makers here tell me the men will not like this type of hand and they tell me that it is better to have the hand closed and for the peg motor to extend the fingers, the spring flexing them. This, of course, is absurd. You wish the patient to re-educate his sense of touch so you must let the spring extend the fingers. If a man is going to get a better working hand by this means, it is a small matter to have an abducted thumb when the hand is at rest. These arms are too flimsily made. No arm will be of much service until it is fitted with a removable hand for walking out purposes and also a working tool, perhaps something like the American two-way clutch, which will be more or less a universal tool. Until something of this nature is evolved I do not think that cinematisation will hold any advantage over existing methods from the industrial standpoint. Here is another model with flexor and extensor pulleys, you will see to what extent the fingers can be flexed or extended onto the fixed thumb by their agency.

This model, actuated by pronation and supination movements of the stump, is, I think, a most ingenious one, and is very sound in that it makes us keep in mind how useful it is to have a long forearm stump. Also the necessity, if such a stump is available, of gaining as much active pronation and supination as possible by treatment. If you can get such a stump and get it flattened antero posteriorly so that the leather cupola does not slip on the stump, which it has a tendency to do if the stump be conical, pronation and supination movements can be made to flex and extend artificial fingers strongly and easily at will.

I asked Mr. Blatchford to make one but I was told that international complications might result should patent rights be infringed. Until this matter is adjusted probably none of the approved limb makers can make the model.

MAJOR M. FITZMAURICE-KELLY (Brighton): Several points of very great interest have arisen already in the discussion, chiefly as to the best type of operation to carry out in these cases, also on questions connected with prosthesis.

As to the type of operation, I think one has to be guided simply by the material at one's disposal. There are certain cases to which one method is applicable, and the other is not, in which the surgeon is given no choice. But the work I have done has made me strongly of the opinion that, when you can get it, the clava type of motor is by far the best. That is so, I think, for several reasons. The first is the immunity it gives from dermatitis. In the case

of tunnels, especially if they are somewhat narrow, there is a great tendency to dermatitis. Even when they are not very narrow, dermatitis is sometimes encountered. I made one myself, in the early days, in the wrist region, and in that case the man has had eczema practically ever since. And, apart from the fact that it has not got a wide excursion, he is virtually unfittable. On the other hand, the club motors leave no crevices; and as the skin will only be subjected to intermittent pressure, it is difficult to believe that it will not harden with use, rather than become tender. Therefore I think club motors have the best chance of surviving.

But there are other, and very much more important, points. The chief of them are these: that when you get, as you have seen in some of the cases shown, a bony nodule carrying the attachment of a muscle, you there get a concentration of the whole power of that muscle at one point: whereas if you make a tunnel through it, it is hampered by adhesions, of either muscle or tendon a little way beyond, and in consequence very much less power is available. Another important point is the range. With a tunnel it is rare to get a range of more than an inch. I have seen cases, especially in the middle of the arm, where the biceps is running free over the brachialis anticus, with a much larger range than that. In most cases, however, the range is small. With a club motor, it depends on how long you make your clubs as to what range you get. Within the limits of nutrition and nerve supply there is no reason why a club should not be 2½ to 3 inches long. It is not uncommon to get, with considerable power, two inches of range.

Another question, which the President touched on, is that of fixity, with the tunnels and with the ansa motors, which are most popular in Italy, there is a tendency for the prosthesis to slide. But when you have two terminal club motors, it is the easiest thing in the world, as you have seen in one of the cases fitted up, to put a soft leather sling between the two. It comes into action the moment the motors come into play, and this prevents the sliding of the bucket on the limb.

As to the selection of cases, I do not quite agree with what Major Alwyn Smith said about our stopping and waiting for the prosthesis to be perfected. I do not think we can expect a prosthesis to be devised until we produce surgically the forces for the surgical instrument maker to apply. I think that unless we produce definite forces, unless we solve the surgical problem and present a definite engineering problem to the engineers, the latter are not likely to get work effectively. We must give them the material to work upon.

As to the sites for these operations, club motors are obviously easiest to make, where the insertions to powerful muscles are available. The earlier cases I chose were those common cases with short stump (i. e., 2½ to 3 inches) below the elbow, where the patient was unfittable in the ordinary way. The stump was too short to fix to a bucket, when flexed at a right angle. The bony nodules make excellent clubs. It seems to me you will never get the same power unless you use bone nodules: you will never avoid the strangulation which must happen when you fit a collar on to a soft tendinous mass. I noticed when one man was working with the exerciser, that one motor turned blue and the others did not. One of the motors was broad, and flat from side to side, and there was a small clearance fore and aft under the collar which allowed the circulation to be carried on. Since that time, I have made all the rings so that they did not fit accurately, but so that they took a two-sided grip on the bone nodule, leaving in that way a small clearance for the circulation. In that case one does not get interference with the circulation while the man is wearing the rings. The elbow joint cases are relatively easy, but there are very few other places in the body which offer a ready-made insertion of muscle into bone. I tried another method, of which I showed one example here, and I am disappointed that another has not come from Roehampton. These are cases of disarticulation at the wrist and elbow. In those cases I use the adventitious attachments of muscles or tendons to bone to form the bony nodules.

Now to describe the technique, which differs somewhat from that described by Major Alwyn Smith. Let us suppose that disarticulation is through the elbow. I design antero-posterior flaps, much in the way he does, and then separate the skin only from the edges, over the supra-condylar lines and edge of the bone. Coming down to the brachialis anticus, one clears it from the intermuscular septa, and then gently separates it from the bone, leaving its distal attachment where it has adhered to the end of the humerus. I cut out half the thickness of the humerus, holding the adventitious attachment of the brachialis anticus to the bone. I turn it up as an anterior club, without disturbing the skin which is adherent to the anterior surface. That helps in the fixation of the nodule. The posterior (triceps) motor is formed in a similar manner the humerus is then sawn 2½ to 3 inches higher up, and the motors clothed with skin, and two motors are produced, carrying the muscles of the upper arm.

In another case I showed, the same thing was done on the wrist. The patient has two club motors with bone nodules, and they are carrying flexor and extensor tendons which have been disturbed. Just after I had done that case, Sir Robert Jones came down to Brighton, and raised a very interesting point as to the fate of those bone nodules. Would they persist, or would they be subject to bone atrophy? We cannot give a final answer yet; that can only be done by experience. But I have had six or seven such cases, and my experience has been that, both as felt by the finger and as seen by the X-rays, the nodules of bone seem definitely to increase in size. Apparently, that depends on the fact that the periosteum is only on one side, and that the osteophytes appear to grow out into the tissues on the other side. At any rate, they form firm and large bony nodules, which I think tend to increase, rather than to diminish. So one can build club motors where the natural insertions are not available. And I think that makes possible a very important extension of the clava method

The lower end of the forearm has one handicap which is exemplified in one case I have done, namely, that the circulation is rather poor, so, in a later case, I have tried to combine the clava with the ansa method. Proceeding as before, I made my two clubs containing flexor and extensor tendons and chips of radius, and a bit of the ulna in one case. The motors were built three inches long, leaving them open at the end. I then sewed anterior skin to posterior skin, so as to form a loop, and containing two bony nodules which will serve as fixation points. I saw several of the ansa motors in Italy, but only one with a prosthesis, and it was the only case I saw with a tool and not an anthropomorphic hand fitted to it. It was a very simple form of parrot-bill forceps activated by one pulley and a spring, and the man, who was working at the lathe, did fairly well with it. It was only a simple grip, but he could hold on to small objects with it. I noticed that on the soft tissue the ring was slipping, and that there was some excorpiation of the skin from the dragging. Another point, which I raised later with the surgeon who had operated, was, that though they described this as an alternating motor, I never saw it fitted with two rings, and he admitted they did not fit two rings to it. And I do not see how it could be done without strangulating the middle portion.

As Major Alwyn Smith has said, the technical difficulty in these cases is keeping the neck to the motor, and the greatest possible care has to be taken to fix the bone in its position long enough, so that it will not escape and leave you with an empty sleeve of skin instead of a motor.

The methods I have adopted in doing it are these: I never dissect the skin flap back from the muscle which is going to form my motor if I can help it. For a posterior motor I only turn up a flap to the base of the olecranon, never disturbing the overlying skin, so as to keep it in position. Next, I fix that nodule with an anchor stitch. I have used several forms of anchor stitch. At present, I transfix the skin-edge, the tendon of the muscle, and the skin on the external side of the motor and thread a rubber tube, then transfix again, and thread on to another piece of rubber tubing, and tie it fairly loosely. That makes a mattress stitch, transfixing the whole motor, passing through the

tendon immediately above the bony nodule so that it cannot slip back, and protected where it is tied by ¾ inch of rubber tubing. I have found it safe to leave it a fortnight, and the bony nodule does not show a tendency to slip. The case which you have seen with a limb on is one of the early cases I did: he is No. 2 of the series, and the last is No. 21.

(Patient demonstrated.)

In this case I made one of the mistakes which it is easy to make. I made the motors too short. A good deal of retraction occurs in these motors, and in this instance I had to carry out a second operation. To prevent the retraction I now preserve the deep fascia and turn in a fascial flap to cover the end of the bone, thus preventing the muscles from becoming adherent to the bone, and thereby shortening the motor. In this case the whole olecranon process is in the posterior motor, and the coronoid process carrying the brachialis anticus, with the biceps muscle stitched into it, in the anterior motor. He has a very powerful pull: I have not measured what it is lately, but on the first occasion I tried it he, without straining, pulled 21 lbs. with the posterior motor, and 15 lbs. with the anterior. It is only fair to say that since that time I have removed a nerve bulb from the anterior, and I believe that now to be the stronger of the two. You have seen the apparatus he is fitted with; it is in a very incomplete state, because it is only two or three weeks since we started fitting him, and there are yet many improvements to come in.

One of the chief questions is that raised by the President: whether one should use a pure cinematic, or a mixed prosthesis, i. e., whether one should rely on the motors entirely, or reinforce them by springs. I incline to the latter view, with all due deference to the President, because thereby one can multiply the movements available. In the hand the arrangement I am having is this: the posterior motor opens the hand, and it closes with a spring. The anterior motor is used to supinate the hand, with a spring recoil for pronation. McKay has had a hand made, but not fitted, for this prothesis. The elbow is of the mechanical type. It seems an advantage to give the movements of pronation and supination as well as the power to grip an object, and I think it is worth while to sacrifice what one would gain in muscular sense so as to have the second movement.

Another point in fitting which I propose, but have not had carried out, is this. The cords from these motors, passing round pulleys in the elbow joint, are apt to hitch in flexion and to hamper the movements of the elbow joint, and also the man is apt to lose much power through friction. I propose to miss the joint altogether in these cases, and to lead the wires which are attached to the collars straight into the channels of a Bowden cable and to apply the power just above where I want it. I think I shall be able to get a much freer elbow joint, and more power at the end of the prosthesis.

This next case I want to show you as the first example of using the adventitious attachment of tendons to form the nucleus. This case was sent to me for re-amputation. He had had an amputation through the wrist, with ankylosis of the inferior radio-ulnar joint, with loss of pronation and supination. I removed about three inches of the radius and ulna, keeping the piece of the end of the radius which had the flexor tendons bound down to it in front, and keeping the piece of the back of the radius which had extensor tendons bound down to it. I thought the posterior tension stitch was pulling, and I took it out a little too soon, and consequently got a short posterior motor. With a little training, I think it will stretch down and give a sound attachment. The anterior motor gives already a sound attachment and a very good pull. The excursion is a considerable one, and should be able to activate the prosthesis very well. He has voluntary pronation and supination developed. And I wanted to show this case because of a remark which was dropped by Major Alwyn Smith as to inequality of excursion of these motors. The excursion of one here is distinctly less than that of the other, but I do not think that will be an insuperable difficulty, because normally the movement of the extensor tendons

is less than of flexor tendons. Anyhow it seems to me easy to decentre the joint to the back, and as less strength is needed in opening the hand than in closing it, the loss of strength by increased leverage is not important. That, however, is mainly a matter for the engineer, and I do not think the requirement will be a difficult one to meet.

The most interesting question of all, I think we shall agree, is the matter of the prosthesis. And the first thing to say about that is, that it is absolutely futile to turn these cases on to the instrument makers, who are brought up in the traditions of the instrument-making trade, and ask them to make a special arm. I think the hand or tool which is supplied will have to vary with the occupation of the man, and there is no particular difficulty in doing that. I am having one case fitted up with a sort of general engineering tool, under the control of two motors. I propose to modify it in this way. At present the triceps opens the tool, and the biceps closes it. But it is asking too much of the biceps to hold on all the time while he is doing work. Therefore I propose to put in a light spring, which will close it in addition to the action of the biceps: that spring will act when holding a light object, and the biceps will reinforce it when necessary. That, I think, should make a fairly efficient tool. The man can do several things with it already, and he was only fitted yesterday; he is not one of the accomplished demonstrators who have worn an artificial limb for a number of years.

There are certain cases in which one has to use tunnels if one is to accomplish anything at all. I think we shall have to see how long these tunnels last in practice. Many patients complain of pain in them, and another serious disadvantage is, I think, the very small excursion which you get in many of them. I think most of the cases who have tunnels will be fitted for light work only, with such prosthesis as you have seen; and for a man who is a clerk and wants to hold a pen it might be useful.

I think those are the lines we want to go upon, and the power we can get out of these motors absolutely justifies us in going on with the work: and it is essential that we should go on in order to give the engineering people the material to carry out their part of the contract. If we do not go on from the surgical standpoint, we shall not get anything tangible out of them.

MR. BLUNDELL BANKART (London): I have only done this operation in two instances, and they were both failures; but I learned something from them, and I thought they might just as well come and be seen. In each of those two cases I think I made the elementary mistake of operating on too small a scale. I realise now that the operation must be, shall I say, massive, that we shall have to cut large flaps, and have large motors, taking out a considerable quantity of bone, so as to get them properly formed. Both of my cases were elbow cases, and I used the olecranon for the triceps, and the coronoid process for the biceps, and in each case I used a mattress fixation stitch, right through the skin from one side, through the tendon and above the nodule out through the skin on the other side. I believe—I am speaking from memory—I left the stitch in a fortnight. In each case the motor slipped up. I have no doubt that the improved technique which other people have developed has abolished that difficulty. But that is the difficulty I met with, and which reduced both my cases to failure. I have rather grave doubts as to the future of the operation. When one sees what a man who really means to can do in a workshop with a simple fixed appliance, one feels some doubt as to whether these motors are going to be used much in industrial activities. From the cosmetic point of view, I think that if an arm can be turned out with two movements, and which will be useful, it will satisfy many. But that remains to be seen.

I noticed that everybody is opposed to the operation on the lower extremity, and I have never seen a case in which it has been done. But one cannot help thinking what an excellent motor the patella would make in a flap, and one knows how difficult is the control of the knee, in an artificial leg. I think that

it will be done when people have had more experience of motor formation in the case of the upper extremity.

MAJOR M. FITZMAURICE-KELLY (answering Mr. Bankart): I did one in the region of the knee, a double club motor, last Saturday. It has not yet been dressed. But they make mighty motors. The method I adopted was to take half the patella for the anterior motor, and for the posterior motor I chiselled off the head of the fibula with the biceps, and a portion of the head of the tibia at the insertion of the semimembranosus, grafting the two together to form a median flexor club behind. He has gone six days with a normal temperature, and seems comfortable. It seems worth doing, and the difficulties of fitting will be practically none, because one could take a bearing from the tuberosity of the ischium and give the man mechanical control of the knee, at first at any rate, to reinforce the voluntary control. The femur is sawn four inches above the knee.

THE PRESIDENT: I have a note from Sir John Lynn-Thomas, who has had to go back to Wales. He was called back unexpectedly last night, so he regrets he is not able to fulfil his engagement to come here.

MR. ROWLEY BRISTOW: I would like to offer one or two remarks on these points. In company with Major Dunn I visited Italy three or four weeks ago, we were able to see what they are doing there. We went to one clinic and saw the surgeon in charge, and he kindly showed us his records and such cases as he had got. He had done the operation 70 times. We asked him what his end-results were, and he said he had never seen a limb fitted, nor the subject to which one was fitted using it. And that—and it is my first point—is, I think, the danger we are faced with. If surgeons all over the country are "let loose on stumps" to cinematize them with tunnels or with motors, and they do not see the end-results of the fitting, they cannot know where they are wrong, nor where they are right. I think it is important that all these cases should be segregated in some limb-fitting centre, or orthopaedic hospital, where they will be in immediate touch with limb-fitting centres. I do not think these operations should be recommended by this Association, at the present time at any rate, as suitable for general use. That is the criticism which we all brought back very strongly from Italy. When we went out, we were told that two distinguished surgeons who had visited them had no use for the operation in any form. That seems to me to be going to the other extreme. From what Major Fitzmaurice-Kelly has shown us, and from what we saw in Rome and Bologna it seems that the only salvation for a man with an arm stump is some reasonable form of cinematic amputation. But cinematisation cannot be a success unless the surgeon and mechanician work together in one institution. At Bologna Putti has 200 beds and 100 men working in his shops. He is seeing them every day, and if the head mechanician has any alteration to suggest, surgeon and mechanical expert consult together. No elaborate arrangements are necessary in order to get hold of the patients; they are there on the spot. I do not think this problem, which we are discussing, will meet with a satisfactory solution until something of the same sort is done here.

With regard to leg stumps, we saw one leg stump which had been cinematised in a boy aged 15, whose leg had been amputated for a tuberculous knee. A skin tunnel had been made in quadriceps and it did not look as if it was very useful, or would prove to be so in the future. I think it is very important at the present time, that the essentials of the business should be thoroughly grasped rather than that we should start away, now, in the present stage, and attempt to cinematise and make prostheses for legs as well. Everybody here seems to regard this problem of artificial legs as easy, finished and done with. I go to the War Seal Foundation, where they have 70 discharged soldiers. I saw three of them this week, and none of the three was wearing his artificial limb. It is well known that artificial arms are hung up behind the door and not used, I think the same can be said of many artificial legs too. In other words, I do not think we ought to feel self-satisfied about the condition of artificial limbs gen-

erally. With regard to the types of motors, those which Major Fitzmaurice-Kelly showed us today are superior to anything I saw abroad. But there may be a use for the loop motor or the tunnel, particularly in the neighborhood of the shoulder joint, using the pectorals and the muscles at the back of the scapula. It seems as if, by means of a motor, something might be done for those cases of disarticulation at the shoulder joint.

Another matter is the prosthesis itself. Major Alwyn Smith, who showed limbs from Italy, said they were toys, and useless. The limb which we saw in Putti's clinic was extraordinarily good. These limbs were very light, they had skeleton buckets, made of thin steel, coated or vulcanised with rubber, and they weighed very little. And in considering the prosthesis there is the question of what the terminal organ should be. Is it going to be something representing the complicated human hand, or should it be something simple? Captain Maxwell favours something representing a hand, and he showed us one which gave promise of achieving that result. I think it important that, at the commencement at any rate, the prothesis should be made as simple as possible. I see no reason why the limb he showed us, which was carrying a long forearm, should not be shortened by one-half, thus bringing the end organ much nearer the motor, and giving better control. Instead of aiming at a complicated apparatus, which will give three or four movements, I think the first thing to do, and as soon as possible, is to have a mechanic working in association with the surgeon to turn out something simple with which the man can work.

Editorial

SELECTIONS FROM THE ANNUAL REPORT OF THE ORTHOPAEDIC DEPARTMENT, MASSACHUSETTS GENERAL HOSPITAL.

January 1, 1919, to January 1, 1920.

The Department of Orthopaedic Surgery at the Massachusetts General Hospital shared with the other Departments a severe handicap to its efficient functioning in the first half of 1919 owing to the members of its staff who were in the service of the U. S. Army.

The chief of the service, the visiting Orthopaedic Surgeon, and two of the assistant visiting surgeons, enlisted early and were discharged late. It was extremely difficult to obtain assistants in the Clinic or House Officers of ability. The very highest praise should be given to the members of the Department who carried on its activities in addition to the onerous burdens of teaching in the Orthopaedic courses given in connection with training of many surgeons who enrolled in the section of Military Orthopaedic Surgery in the U. S. Army. The Department wishes to express its thanks to Dr. C. F. Painter whose temporary appointment on the staff was of great value.

Social Service.

The value of the Social Service work as an integral part of the Clinic has been again amply demonstrated. One of its most important functions is a sympathetic discussion with each patient referred to the house, of his or her resources and the probable length of time during which he will be cut off from wage earning.

At the present time, a follow up system (temporarily suspended during the war) is being re-installed with the help of this department.

In October, Col. E. G. Brackett, for many years the Chief of the Clinic, resigned. Dr. R. B. Osgood has been appointed in his place. The loss of Dr. Brackett's services is a very heavy one for

this Clinic and for the whole Hospital. His able conduct of the Service inspired the loyalty of every member of the Department. He possessed the personal affection of all his Staff. He has been appointed on the Consulting Staff of the Hospital and it is hoped that after his return he will still continue to be actively interested in Departmental and General Hospital matters.

ORTHOPAEDIC SURGEON AND CHIEF OF SERVICE.

Dr. Robert B. Osgood, continuous service.

ASSISTANT VISITING ORTHOPAEDIC SURGEONS.

Dr. Mark H. Rogers, continuous service.
Dr. Zabdiel B. Adams, continuous service.
Dr. C. Herman Bucholz, continuous service.

ORTHOPAEDIC SURGEONS TO OUT-PATIENTS.

Dr. Murray S. Danforth, continuous service every other day.
Dr. Harry C. Low, continuous service every other day.
Dr. Lloyd T. Brown, continuous service every other day.
Dr. Louis A. O. Goddu, continuous service every other day.
Dr. Marius N. Smith-Peterson, continuous service every other day.
Dr. Loring T. Swaim, continuous service every other day.
Dr. Andrew P. Cornwall, continuous service every other day.
Dr. Philip D. Wilson, continuous service every other day.

ASSISTANTS TO ORTHOPAEDIC SURGEONS TO OUT-PATIENTS.

Dr. L. P. Felch, continuous service every other day.
Dr. W. J. LaMarche, continuous service every other day.

HOUSE OFFICERS.

Dr. Jackson, House.
Dr. Spiers, House and Out-Patient Department.
Dr. Surls, House and Out-Patient Department.

Special Assignments and Clinics are as follows:
Poliomyelitis Clinic—Dr. Low.
Scoliosis Clinic—Dr. Bucholz.
Posture Clinic—Dr. Brown and Dr. Swaim.
Club Foot Clinic—Dr. Z. B. Adams and Dr. Brown.

Congenital Deformities—Dr. Z. B. Adams.

Unusual Back Lesions with Referred Pain—Dr. Danforth.

Peroneal Spasm—Dr. Goddu.

Internal Derangements of Joints and Tuberculosis of Knee—Dr. Osgood.

STUDIES OF END RESULTS.

End Results of Bone Graft Operations—Dr. L. T. Brown.

End Results of Arthrodesis of Hip for Non-Tuberculous Arthritis—Dr. Rogers and Dr. Spiers.

End Results of Operation for Excision of the Knee—Dr. R. B. Osgood.

End Results of Operation for Knock-knee and Bow Legs by Epiphyseal Separation—Dr. Z. B. Adams and Dr. H. C. Low.

End Results of Stabilizing Operation on the Feet, Infantile—Dr. W. L. Adams.

End Results of Hallux Valgus Operation—Dr. Spiers.

End Results of Operation for Internal Derangements of Joints, Cartilages and Osteochondritis Dessicans—Dr. R. B. Osgood and Dr. Surls.

End Results of Congenital Dislocation of Hip—Dr. Z. B. Adams.

Treatment and Results in Scoliosis—Dr. C. H. Bucholz.

End Results of Osteotomies for Correction of Bow Legs and Knock-knees—Dr. L. P. Felch.

RESEARCH.

Dr. M. S. Danforth—The Anatomic Explanation of Referred Symptoms in Low Back Lesions.

Dr. L. A. O. Goddu—The Etiology and Treatment of Peroneal Spasm of the Foot.

Dr. L. T. Brown—The Technique and End Results of the Exogenous Bone Grafts.

Dr. M. N. Smith-Peterson—Approaches to Joints.

Dr. Z. B. Adams—The Reduction and After Treatment of Congenital Dislocations of the Hip.

Dr. Mark Rogers—The Operative Treatment of Old Tuberculosis of the Hip in Adults.

Dr. R. B. Osgood—The Operative Treatment of Tuberculosis of the Knee in Adults.

Dr. H. C. Low—The End Results of Fixation Treatment of Tuberculosis of the Hip in Adults and Children.

FURTHER SUBJECTS FOR RESEARCH.

1. Confirmation of Brooks' and Allison's silver nitrate fascia in arthroplasty.
2. Cinematic Amputations.
3. Experimental Osteochondritis Dessicans.
4. Experimental Legg-Calve-Perthe's disease.
5. Effect of motion on fractures under traction.
6. Effect of motion on Tuberculosis of joints.

ANNUAL MEETING BRITISH ORTHOPAEDIC ASSOCIATION

Held in the Rooms of the Medical Society of London, on
Friday, November 14th, 1919.

MR. E. MUIRHEAD LITTLE, F. R. C. S.,
President, in the Chair.

EXECUTIVE PROCEEDINGS.

The Treasurer's report was received and adopted.

Candidates for election.

THE PRESIDENT: There are two candidates for election. Mr. S. T. Irwin, of Belfast, and Mr. R. Ollerenshaw, of Manchester. Both have submitted theses, which have been read by the Nomination Committee and approved, and their names are now before you for election.

Carried unanimously.

Election of Honorary Member.

THE PRESIDENT: It is proposed to elect as an Honorary Member, Professor Arthur Keith. You all know his work, and he has done very much by that work to popularise orthopaedic surgery. He is a distinguished anatomist, and the Nomination Committee thought his election would do honour to this Society.

Carried unanimously.

Election of Corresponding Member.

THE PRESIDENT: There is also down for election as a Corresponding member, Dr. Murk Jansen, of Leyden. He is very well known to us all, and I think he is a very charming personality. He is a very ingenious writer on anatomical and orthopaedic subjects.

Carried unanimously.

Election of officers, 1920-1.

THE PRESIDENT: We now come to the important business, the election of officers for the next year. You have the list of nominations before you. As

President, Sir Robert Jones; as Vice-President, Mr. Tubby; as Treasurer, Mr. Bennett; our present Honorary Treasurer; and as Secretary, Mr. Harry Platt, our present Secretary. I do not think I really need say anything about any of these gentlemen. Sir Robert Jones is, of course *facile princeps* in this domain, and ought to have been President before, in my opinion. Mr. Tubby also has done a great deal for orthopaedic surgery. The work of the Honorary Treasurer and the Honorary Secretary are well known too. Is it your pleasure that I put these names *en bloc?*

Carried unanimously.

Communication from Mr. Girdlestone.

MR. G. R. GIRDLESTONE: Sir, the communication I have to make concerns this paper, "The Care of Crippled Children," which, I think, you all have, which has been published in "The British Medical Journal." The paper was written by Sir Robert and myself because we felt there was no proper organization of orthopaedic treatment. In some places there are hospitals, in some there are none. One felt that hospitals ought to be instituted all over the country for the cure of cripples of all sorts. It was published in the "British Medical Journal" rather than being brought before this Association, firstly, because time was pressing, and next, it was felt to be vitally important that all the medical practitioners of the country should become aware of what ought to be done and what could be done for these cases. It is the universal experience, of all orthopaedic surgeons that they get cases coming within their province a greal deal too late. It is equally their experience that, having treated a case, it is exceedingly difficult to manage after-care. Those were the two points in regard to which we particularly appealed in this paper. Taking an established hospital in Shropshire as a guide, we have analysed the cases which have been attending that hospital, and these are typical of those requiring orthopaedic treatment. We have endeavoured to show what is the class of case we must endeavour to cater for. These require orthopaedic measures, and almost all of them are cases which need prolonged treatment, and treatment in the open air. Further, they demand educational facilities, and, if possible, some sort of handicraft or some sort of manual training which will enable them to re-start in life with greater capacity than they would have otherwise. Some of the children only come in for a short time, it is true, but some of the cases have to remain in for two or three years, and some of them must almost inevitably remain crippled. We felt, therefore, the need of education and some handicraft instruction added to orthopaedic measures in an open air country hospital. And it was clear that the general hospitals could not provide the needed treatment. They have not got the beds available for these cases, nor the country hospitals, nor the educational facilities; all of which are necessary. Therefore this communication was published in the "British Medical Journal" so that the country might realise—that is, the general practitioners might realise—the type of cases we are hoping to treat, and the way in which we are hoping to treat them. And one felt that the second step was to bring this to the notice of the British Orthopaedic Association, as its members are essential for the success of such a scheme. In planning the paper, we felt that some Central London Committee was necessary, so as to co-ordinate the activities of the various orthopaedic hospitals everywhere throughout the country. In order to obtain governmental authority,

it would have to be associated with the Ministry of Health, and, in order to obtain the best results from clinical organization the British Orthopaedic Association should be well represented upon it.

I have brought this paper to your notice today in the hope that when Sir Robert Jones comes back, a sub-committee may be formed to approach the Ministry of Health, with the view of this work being commenced. The opportunity ought not to be lost, because we have these Pensioner Orthopaedic hospitals all over the country, and if we act now, it will be easy to develop the Pensioner Orthopaedic hospitals into the hospitals of the kind we advocate. The Pensions Ministry is organising "Regions," and is attaching to orthopaedic hospitals outpatient clinics, which will be inspected and brought into touch with the central hospital. That is the scheme we have outlined, and it will be perfectly easy, if we can persuade the Ministry of Health to co-ordinate their activities with those of the Ministry of Pensions to make the central hospital the same, the outpatient clinics the same. And as the need for pensioner work grows less, so the need for children's work can be supplied and be made to fit in. Therefore one feels that now is the time to take action. I do not know whether we should do anything now, or wait until Sir Robert Jones returns.

THE PRESIDENT: I think we all agree with the plan of Mr. Girdlestone. And I think the better plan will be for him to propose a resolution on the subject, affirming the need of a sub-committee, and that it be formed after the return of Sir Robert Jones.

MR. GIRDLESTONE: I propose that the President be authorised to form a sub-committee in association with Sir Robert Jones on his return, for the purpose I have outlined.

MR. FAIRBANK: I second that.

Carried.

MEDICAL VETERANS OF THE WORLD WAR.

Col. Frederick F. Russell, M. C., U. S. Army, secretary of the Medical Veterans of the World War, states that during February, 169 new members joined, making a total membership of 2,711 divided as follows:

Medical Corps, U. S. Army	1,245
Medical Corps, U. S. Navy	51
Medical Corps, U. S. P. H. S.	62
Contract Surgeons, U. S. Army	88
Acting Assistant Surgeons, U. S. P. H. S.	47
Members Local Board	527
Members Examiner, Local Board	183
Members Medical Advisory Board	508

—*Journal A. M. A.*

EXPERT EVIDENCE—FRACTURE CASES.

In a cross-action for malpractice, the exclusion of a question asked a physician on cross-examination, intended to show that there was no bony union in the fracture which a doctor had rebroken was held error; the question being calculated to test the competency of the witness and discredit his statement on direct examination that he had found such osseous callus. Whether a physician called as an expert witness be permitted to illustrate his testimony by means of a human skeleton is held a matter left to the sound discretion of the court, but where its use could not have aided the jury, denial of permission was not abuse of discretion. It is held that only an expert could properly determine and testify as to the nature of the treatment and required amount of force that might be exercised to break adhesions in fractured bones, but a requested instruction, implying that only an expert could testify as to the amount of force that was actually used was properly refused.—Dameron v. Ansbro, (Cal.) 178 Pac. 874.—*Medical Record.*

FREE DIAGNOSTIC CLINIC FOR BUFFALO.

The Board of Managers, Department of Hospitals and Dispensaries, of Buffalo, N. Y., announces the inauguration of a free diagnostic clinic for the use of physicians of Buffalo and Erie County. The clinic is for diagnosis only and is designed primarily for the use of physicians' pay patients who cannot afford the customary consultation fee. No treatment will be given. A report of the findings in each case, signed by the examiner, will be mailed to the physician sending the patient. The members of the diagnostic staff are chiefs of divisions on the attending staff of the Buffalo City Hospital and also hold professorships in the medical college. Dr. W. W. Plummer is assigned as consultant in Orthopaedic Surgery.

Dr. Hinman K. DeGroat, medical superintendent of the Department of Hospitals and Dispensaries, will be in charge of examinations.—*New York Medical Journal,* February 28.

Announcement

ANNOUNCEMENT 1920 ANNUAL MEETING OF THE AMERICAN ORTHOPEDIC ASSOCIATION.

To the Editor of the Journal of Orthopaedic Surgery:

It is felt by the President that the following information will be of interest to the members of the Association:

The next meeting of the Association will be held in Toronto, Canada, on June 7, 8, 9 and 10, 1920. Monday, the 7th of June, will be a Clinical day and preparations are well under way to make this a most enjoyable and profitable day. It is hoped as many members and guests as possible may plan to be present to take advantage of the opportunities of seeing the work of the Canadian Hospitals, both military and civilian. The three following days will be occupied with the regular program of the Association, and the Program Committee is already at work and a most attractive program is planned.

We had hoped to have the British Association meeting with us in joint session, but on account of war conditions the Secretary of the British Association states it will be impossible to accept our invitation.

We have, however, individual acceptances of our invitation by a number of continental surgeons, and we are delighted to be able to state that Sir Robert Jones will be present, together with a number of other men from the British Isles who have rendered distinguished service during the war. Among these are Major Naughton Dunn of Birmingham, Major T. H. Armour of Liverpool, Major Rowley Bristow of London, and others. Professor Jacques Calve, of Berck Plage, France, has also promised to be present and contribute to our program.

Professor Putti, of the Rizzoli Institute, Bologna, Italy, has also consented to visit us and will make an interesting contribution.

Toronto is a noted convention city and should be at her best in June.

Will not all the members make a personal effort to be present that the Association may go "over the top" in an effort to reach our objective, namely, the greatest meeting in the history of the Association.

CLARENCE L. STARR, *President.*

Dr. G. W. Sinclair of Vancouver, B. C., has telegraphed that the Orthopaedic Section of the C. M. A. will meet in Vancouver, June 22-25. It as been arranged that papers will be presented among others by the following: Drs. Gibney, Galloway, Abbott Albee, A. McCausland, Patterson and Orr.

The Central States Orthopedic Club will meet for a day at Memphis as part of the trip to the A. M. A. meeting in New Orleans. Dr. J. P. Lord, of Omaha, is President and Dr. F. W. Gaenslen is Secretary. The meeting will be on April 26.

Personal

Dr. Eben W. Fiske has announced the re-opening of his offices for the practice of Orthopedic Surgery at 6079 Jenkins Arcade, Pittsburgh, Pa.

Dr. Jay Harvey Bacon announces his return to civil practice. During the last four months Dr. Bacon was head of the department of Orthopedic Surgery in the Base Hospital at Camp Hancock, Ga. He is at 800 Peoria Life Building, Peoria, Ill.

Town Topics of February 5th contains a short but generous appreciation of Dr. Newton M. Shaffer of New York. Dr. Shaffer's notable activities in connection with the development of Orthopaedic Surgery in this country are related and various personal and professional data of importance recorded.

Dr. J. D. Griffith was one of the guests at a recent dinner in Kansas City in honor of those who had completed fifty years of practice. Dr. Griffith is just 70. He came to Kansas City at the beginning of his professional career in 1870. Born in Jackson, Miss., Feb. 12, 1850, he completed his medical course in the University of New York at the age of 20. Dr. Griffith has enjoyed not only the respect and confidence of his patients and associates, but their affection as well. This was admirably shown by the spirit which animated his friends at the dinner. Dr. Clarence B. Francisco introduced Dr. Griffith with an eloquent testimonial to his professional achievements and his own personal regard. Dr. Griffith has always had a commanding professional position in Kansas City, having been for 46 years chief surgeon and now chief of staff of St. Joseph's Hospital, a handsome institution of 350 beds. At the office the Doctor is surrounded by books and pictures to show to how many friends and places his acquaintance and influence extend. Dr. Griffith is still an active and enthusiastic practitioner.

Orthopaedic Titles in Current Literature

Prepared by Dr. J. E. M. Thomson, Lincoln, Nebraska.

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Alessandri, B. The Technique and Preferential Sites for Cinematization of Amputation Stumps. Clin. Chir., 1919, XXVI, p. 565.

Angeletti, E. Deformity of Shoulder Resembling Coxa Vara. Chirurgia degli Organi di Movimento, Bologna, December, 1919, 3, No. 5-7, p. 513.

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Arey, L. A.—Origin, Growth and Fate of Osteoclasts and Their Relation to Bone Resorption. American J. of Anatomy, Philadelphia, January 15, 1920; 26, No. 3, p. 315.

Asam—Splint for Fractured Radius Munchener Medizinische Wochenschrift, Munich, November 7, 1919, 66, No. 45, p. 1293.

Auvray—The End Results of Operations Upon 39 Radial Nerve Wounds Performed 1915 and 1916. Bull. et. mem. Soc. de Chir. de Par, 1919, XLV, p. 1291.

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Barron, N., and Bainbridge, W. S.—The Barron Ladder in the Treatment of Flat-Foot. International Journal Surgery, 1919, XXXII, p. 341.

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Buckley, J. P.—Case of Dislocation of Cervical Spine. Lancet, London, January 17, 1920, 1, No. 5029, p. 149.

Buerki, R. C., Boise, Idaho.—Splints Used for Peripheral Nerve Cases at U. S. Army General Hospital, No. 11. Archives of Neurology and Psychiatry, February, 1920, 3, No. 3, p. 151.

Byfield, A. H., Iowa City—Etiology of Arthritis Deformans in Children. American Journal of Diseases of Children, February, 1920, 19, No. 2, p. 87.

Caccia, F.—Treatment of War Wounds of Joints. Chirurgia di Movimento, Bologna, December, 1919, 3, No. 5-6, p. 562.

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Current Orthopaedic Literature

A Roentgenologic Study of Metastatic Malignancy of the Bones. A. B. Moore, M. D. *American Journal of Roentgenology*, 1919, Vol. VI, No. 12, p. 589.

Pfahler in 1916 directed attention to the characteristic roentgen appearance of metastatic carcinoma of bone and the necessity of thorough X-ray examination of known and suspected cases of malignancy, and the author further emphasizes the necessity in a summary of 65 such cases seen at the Mayo Clinic.

Froenken, von Recklenhousen and others describe two types of secondary bone metastasis—the osteoclastic and osteoplastic.

The osteoclastic is characterized by lacunar absorption and destruction of bone, causing a porosis of osseous tissue. While the osteoplastic also has lacunar absorption, there is a marked thickening of the bone due to the collection of malignant cells and the calcification of the process. Some observers find the two types occurring simultaneously in the same bone.

Roentgenologically, the osteoclastic form appears as decreased density, the bone having a honeycombed aspect; while the osteoplastic appears irregularly increased in density, being chalky without cortical or periosteal thickening.

The osteoclastic occurs more often as secondary to breast malignancy, the osteoplastic more often from carcinoma of the prostate.

Authorities disagree as to the course of extension, whether by blood stream or lymphatics.

Contrary to the findings of Mathews in the author's series, metastases from primary thyroid carcinoma are relatively rare. Of the series, the primary growth was:

Breast	36 Cases	Sigmoid	1 Case
Prostate	11 Cases	Uterus	1 Case
Kidney	7 Cases	Abdominal mass of unknown nature	3 Cases
Thyroid	2 Cases	Primary source unknown	3 Cases
Vulva	1 Case		

In 1,600 cases of cancer of the stomach no secondary bone involvement was found—probably due to the rapid and fatal course of the process. Of the seven kidney tumors, six were hypernephromas and one a so-called neurocytoma, a tumor originating in the sympathetic nerves of the adrenal, this being the case of a 13-year-old boy with skull and sternal metastases. Of this series, the metastasis was distributed as follows:

Spine	22 Cases	Sternum	1 Case
Pelvis	11 Cases	Radius	3 Cases
Femur	9 Cases	Skull	3 Cases
Ribs	6 Cases	Tibia	2 Cases
Humerus	6 Cases	Bones of the hand	1 Case
Clavical	1 Case		

This series does not coincide with Risley, who states that metastasis is rare below the elbow and knee. In the 22 cases of vertebral involvement, 75 per cent were located in the lumbar region.

Th clinical histories show that the average age of these cases was 50 years, 42 being females and 23 males. The time of appearance of secondaries after the discovery of primary growth was 2½ years.

The most common symptom is pain, noted in 57 per cent, resembling a neuritis, increased by motion. Superficial swelling is uncommon, while irregularities may be noted on palpation. Spontaneous fractures occurred in six of the 65 cases. In two there was no previous indication of malignancy. In but three of the cases was there any evidence of lung involvement.—*J. E. M. Thomson, Lincoln, Nebraska.*

DISLOCATION OF INNOMINATE BONE. John T. Murphy. *American Journal of Roentgenology*, 1919, Vol. VI, No. 12, p. 601.

According to Stimpsen, a review of the literature reveals but 15 authentic cases of dislocation of the innominate bone, of which two were complicated by fracture.

The author's case is that of a six-year-old boy who fell from the seat of a heavily loaded wagon and the abdomen was passed over by the front wheel. Shock was marked and patient could not be moved for ten days, when the leg was flexed and foot everted. Hematoma covered the entire lumbar region. X-ray revealed a backward and upward dislocation of the entire bone without fracture, with evident tearing of anterior and posterior interosseus ligaments of sacroiliac joints, and also ligament of symphysis pubis.

Attempted reduction under anesthesia failed. Fixation in plaster cast for three weeks brought normal function.—*J. E. M. Thomson, Lincoln, Nebraska.*

MYXOMA OF BONE, WITH REPORT OF CASE OF MYXOCHONDRO-SARCOMA OF THE FEMUR. A. Cotton and S. McCleary. *American Journal of Roentgenology*, 1919, Vol. VI, No. 12, p. 594.

The authors recall a case of myxoma of the femur previously reported in 1917, which was amputated at the hip joint and which developed secondaries in the lower abdomen more than two years after operation. Death occurred without pathological examination of tumor mass.

The second case was that of a man 45 years of age with a medullary tumor of the femur which was diagnosed as myxochondroma, and which, after chiseling and curetting, healed only to recur and require amputation at hip joint when diagnosis of myxochondro-sarcoma was made, with alternate metastasis in lungs and stump.

It is the authors' opinion that they were dealing with multiple chrondromata primarily, which underwent myxomatous change with subsequent sarcomatous development.—*J. E. M. Thomson, Lincoln, Nebraska.*

COCCYGODYNIA. FURTHER EXPERIENCE WITH INJECTIONS OF ALCOHOL IN ITS TREATMENT. By Frank C. Yeomans, M. D., F. A. C. S., New York. *Surg., Gynec., and Obst.*, Vol. XXIX, December, 1919, No. 6.

1. Neuralgic theory that trauma caused violent nerve irritation which persists without any demonstrable anatomical nerve lesions.

2. Neuritis from pressure of the foetal head on the terminals of the sacral plexus.

3. Theory of injury of the cocoyx, resulting in fracture, dislocation, ankylosis, or caries.

4. Symptomatic, i. e., a referred pain of central origin due to many functional or organic diseases of the central nervous system, as hysteria, neurasthenia, irritable spine, the traumatic neuroses, tabes dorsalis, toxaemia, or "habit pain."

A history of traumatism within the pelvis, as in difficult labor or external violence, most commonly a fall, is so often responsible for the condition that searching inquiry must be made in every case. Rarely there is a gross lesion of the coccyx but as a rule the injury affects the periosteum alone and the soft structures adjacent or attached to the bone,—muscles, fascia, ligaments and nerves.

The nerves composing the coccygeal plexus are the fourth and fifth sacral, the coccygeus and the inferior haemorrhoidal branch of the internal pudic. There are also on the anterior surface of the coccyx two ganglia of the sympathetic, connected to each other by fine nerve filaments to the last sacral ganglion of the chain which constitutes the pelvic sympathetic.

The coccyx is surrounded by compact structures, largely fibrous, which the delicate network of nerves traverses. Injury of these structures initiates an inflammatory reaction with proliferation and later contraction of the new fibrous tissue and compression of the nerves. Fracture or dislocation of the coccyx may cause pressure pain.

Symptoms.—The chief symptom is a characteristic, spasmodic aching pain, usually localized in the region of the coccyx, aggravated by sitting or rising, and seldom affected by urination or defecation, though constipation is usually present.

Diagnosis made by a thorough examination, both general and local. The former embraces the spinal column to discover injury or disease and the nervous system to exclude tabes dorsalis, hysteria, the neuroses, etc.

The local examination is made with the patient in the Sims' posture.

Lesions of the anal canal and rectum, simulating coccygodynia, are to be excluded.

In general the prognosis is good.

Excision of the coccyx is a simple operation but should be reserved for those cases in which it is diseased or deformed or after the injection treatment has failed. The fact that in some cases the pain persists after the removal of a clinically normal coccyx and is relieved in others, indicates that in those which were relieved the nerves were excised together with the bone.

The treatment is an application of the principle of injecting sensory nerves with 70 to 80 per cent alcohol, thereby causing their degeneration.

Technic.—The injections are made easily at the office under strict aseptic precautions. The patient assumes the Sims' posture and the region of the coccyx is painted with tincture of iodine. An aseptic syringe of 2 cubic centimeters' capacity is filled with 80 per cent alcohol and armed with a 2-inch needle of fine gauge. With the index finger in the rectum, the point of maximum tenderness is determined by counter-pressure with the thumb outside. Usually this is just distal to the tip of the coccyx or slightly lateral to it. Maintaining the finger in the rectum as a guide, and to guard against its puncture, the needle is inserted through the skin in the mid-line directly to the tender point. When this is reached the patient may exclaim from exquisite but tolerable pain and 10 to 20 minims are injected slowly. The needle is withdrawn quickly and the iodine on the skin is neutralized with alcohol. The pain from the injected alcohol lasts only a few minutes but a dull ache may persist for 24 hours. A single injection has cured a few cases but generally owing to the broad distribution of the coccygeal plexus of nerves, one to ten treatments with an average of three or four have been necessary. The interval between injections should be from five to seven days and the solution is always deposited at the point found most tender at the time of injection.—*Leo C. Donnelly, Detroit.*

SYMPOSIUM ON CLOSED TRAUMATIC LESION OF THE WRIST. Albert Mouchet. *Revue de Chirurgie*, May-June, 1919.

After discussion of the anatomy the speaker reports on experimental studies made on 90 wrist specimens in order to establish the mechanism of the traumatic lesion. These lesions are produced either by hyper extension without impact or with impact or fall in hyperextension, by simple palmar flexion or by torsion in pro and supination. The fracture of the lower extremity of the radius, fracture of the lower extremity of the ulna, radiocarpal dislocation and traumatic lesions of the wrist are discussed.

Regarding fracture of the lower extremity of the radius it has been pointed out that function should never be sacrificed to alignment or form and that successful reduction is of comparitively little value if not followed by speedy mobilization.

Two types of traumatism of the wrist are deserving of special mention; the fracture of the scaphoid and the dislocation of the os magnum, or rather, as Mauchet calls it, the sub-total retro-lunar dislocation of the wrist. These two lesions are frequently associated.

Aside from this there exist fractures of the semi-lunar bone and fractures of the os magnum; they are more frequent than is generally believed.

Increase of the antero-posterior diameter of the wrist, and a sort of bayonet deformity, but situated more peripherally, suggests dislocation of the os magnum, especially if there is also a shortening of the wrist with claw hand, or at least, weakness in the flexors of the fingers.

A localized swelling in the circumference of the wrist speaks in favor of fracture of the scaphoid.

Regarding the semi-lunar bone, one should remember that it can be explored from the volar side where it should be found immediately above the

lower palmar fold of the wrist. The scaphoid can also be explored from in front over the radial artery and above the root of the thenar, between tendon of the flexor carpi radalis and the long abductors of the thumb. Dorsally, it can be palpated in the tabatiere and underneath the tendon of the extensor pollicis longus.

The integrity of the relations between the tips of the styloid processes of the radius and the ulna will eliminate radio-ulnar lesions and points to the carpus as the seat of lesion. The motion of the fingers in fracture of the scaphoid is usually unimpaired. Where the flexion power of the fingers is greatly diminished dislocation of the os magnum should be suspected. Pain in the distribution of the median and ulnar nerves especially the median, are also very frequent in the latter condition. X-ray pictures should always be taken in two directions. The reading of the X-ray plates is not always easy and errors in interpretation often occur in injuries of the carpus.

The dislocation of the os magnum must be reduced speedily in order to become possible, at all. After one month has passed it should never be attempted. It is then necessary to remove the semi-lunar bone and in cases of accompanying ing fracture of the scaphoid resection also the fragments of the latter bone which is attached to the semi-lunar.

An isolated fracture of the scaphoid will be benefited by operation in cases of malunion or persisting painfulness.

Savarioud (Paris) observed two cases of dislocation of the semi-lunar bone. One case has been treated by massage for two months. The pain was very marked and fingers immovable. Enucleation of the semi lunar bone gave relief.

In the other case there was recent dislocation of this bone accompanied by lesion of the scaphoid and neighboring bones. Reduction under chloroform was carried out, but dislocation recurred three weeks later. Then the semi-lunar was removed together with the bone fragments in the neighborhood. Following this the pain disappeared.

Billet reports on a very peculiar case of dislocation of the carpus due to a railroad accident. The hand was forced into right angles with the forearm. This injury, which was an open one, was treated by resection of the wrist. Concerning dislocation of the semi-lunar bone, Billet is of the opinion that bloodless reduction is preferable to operative intervention. In one case of complete dislocation of the semi-lunar with fracture of the scaphoid and of the styloid process of the radius he obtained reduction and rapid permanent recovery. On the other hand, in another very simple case reduction was found impossible on the second day and an operation had be performed.

Judet (Paris) mentions three cases. In the first case there existed an epiphyseal separation of the left radius in a patient 15 years old, the injury following a fall. The reduction was obtained by dorsal flexion. The result was excellent. The second case observed concerned a case of recurrent carpal dislocation, a wrist a ressort. Immobilization was necessary for three months and was followed by recovery.

The third case was a very rare combination of fracture of the radius with dislocation forward of the ulna, a combination which is very difficult to handle. Following reduction and immoblization a good result was obtained.

Willems has studied the method of active moblization in injuries of the

wrist. He finds that its application is in the larger joints and is also recommendable. He points out that in order to avoid persistent palmar flexion, immoblization should be carried out in dorsi flexion, and even if ankylosis occurs in will be most favorable to function.

Potherat (Paris) finds the semi-lunar dislocation to be a well known feature. It occurs frequently in time of peace, especially among horse-men and automobilists, and he asks why it is found comparatively seldom in war surgery. This is doubtless due to the fact that the lighter cases of this kind were neglected and the more severe cases were immediately evacuated. The dislocation of the semi-lunar is more frequent than would appear from the reports. It is also easy to diagnose. Regarding the treatment, recent cases should be reduced under anesthesia, in older cases operative procedure is indicated.

One should keep in mind that reduction is possible after a longer period of time than usually mentioned.

Potherat was able to accomplish reduction six weeks and even two months after the accident.

Berard (Lyon). In regard to dislocations of the semi-lunar the speaker believes also in a longer possibility of reduction although the time is variable and depending upon anatomical conditions. If reduction is not possible removal of the semi-lunar bone is indicated. Wherever fracture of the lower end of the radius co-exists, immobilization is necessary in all cases.

Froelich (Nancy) believes that bloody reduction of the semi lunar should not be rejected. He reports a case with good result.

Paschoud (Lausanne). Based upon the study of 14 cases of closed lesion of the semi-lunar bone, from his own observation and 10 from the service of Quervain, points out that dorsal flexion and radial abduction is the position of choice for production of the dislocation of the semi-lunar bone. In this position the triangular ligament offers the least resistance and the radio ulnar joint is relaxed. If the os magnum forms the key to the carpus the semi-lunar might be compared with the bolt.

Masini (Marseille) contributes one observation of forward dislocation of the semi-lunar bone caused by fall upon the back of the flexed wrist. This case was easily reduced under general anesthesia and recovered completely in 20 days.

Tedenat (Montpellier) has seen three cases of backward displacement of the wrist complicated by evulsion of the styloid process of the radius or ulna.

Rocher (Bordeaux) presents seven observations of fracture of which four concern the scaphoid; one the scaphoid and styloid process of the radius, one was an epiphyseal separation of the radius and one a dorsal dislocation of the trapezium.

The latter was produced by fall upon the palm and necessitated for reduction, removal of the scaphoid and lengthening of the retracted tendon of the index and third finger.

Lance (Paris) mentions a case of fracture of the semi-lunar bone by direct blow. This case showed marked limitation in the movements of the wrist. The fractured semi-lunar was removed by the posterior route. The patient recovered in 20 days.

Chilbet (Aurillac) found twice an isolated forward displacement of the tip

of the ulna, a very rare occurrence. Reduction was made in either case by forcible pronation.

Peraire (Paris) points out to the advisability of using the stereo-radiograms. Such carpal lesions as were mentioned by the speaker were taken for syphilis or tuberculosis or were sometimes regarded as rheumatoid or gonorrheal. He contributes a number of cases of his own observation; two cases of simple fracture of the scaphoid; one of fracture of the scaphoid with fracture of the lower end of the radius; one fracture of the triquetrum; two simple dislocation of the scaphoid without fracture; one of incomplete dislocation of the scaphoid with fracture of the base of the first metacarpal; one dislocation of the scaphoid with fracture of the first and second metacarpal; one complete dislocation of the scaphoid with fracture of that bone; and finally one observation of dislocation of the bases of the fourth and fifth metacarpal.—*A. Steindler, Iowa City, Ia.*

AMPUTATION STUMP IN RELATION TO FITTING ARTIFICIAL LIMBS. E. J. Rose, M. D., Capt. M. C., U. S. Army, Gallipolis, Ohio.

An ideal amputation should be of such a length as to enable the artificial limb makers to fit the most useful type of limb built to perform as nearly as possible the function of the absent member. The stump should be covered by skin and subcutaneous tissue just slack over the end and freely movable. There should be no redundant skin or pointed corners. There should be a firm non-adherent scar or cicatrix, the scar should be linear and placed where it will not be subjected to pressure or irritation by the artificial limb. The edges of the skin about the scar should not be turned in. The stump must be entirely free from pain or tenderness. The principal nerves should be cut as short as possible at the primary amputation. There should be no superficial or deep edema. There should be shrinkage and consolidation of all parts of the stump. The joint next above the amputation should possess full range of voluntary movement. The integument must become so hardened as to be able to bear subsequent pressure and especially is this true of stumps of the lower extremity whose duty is primarily that of a support, and secondarily acting as a lever for moving the apparatus.

The importance of preserving as much as possible of the thumb or even of one finger can scarcely be insisted upon too emphatically. A thumb or even part of a thumb, or finger with fair range of motion and nerve supply though there be no portion of the hand to which it can be opposed, is very much more useful than an artificial contrivance. Amputation at the wrist should never be done if it is at all possible to retain any portion of the hand or carpus. Amputation through the pronator quadratus is preferable to a disarticulation of the wrist.

From the prosthetic point of view the best site for amputation in the forearm is at the junction of the middle and lower thirds. If an appliance is not to be worn, as long a stump as possible should be preserved. The minimum forearm stump measured from the tip of the olecranon process is 3 inches. A forearm stump less than this ceases to exist as a stump anteriorly when

flexed. When it is possible to retain only such a short portion of the bone, the flexor muscles of the wrist and fingers, the supinator longus and the extensors carpi radialis longior and brevior should be removed at their humeral attachments so as to leave the anterior surface of the forearm stump as flat as possible. Amputation through the elbow joint offers no advantage over amputation immediately above it, since in the former case the satisfactory fitting of an artificial arm is more difficult.

The point best suited for amputation in the upper arm is about one inch above the condyles of the humerus. Above this point it is particularly desirable to secure as long a stump as possible. A short arm may be lengthened by dividing a portion of the pectoralis major and teres minor tendons and thus raise the anterior axillary fold. It seems advisable to retain any portion of the upper end of the humerus, even if only the head, rather than remove it since the appliance is fitted much more easily when the glenoid cavity is filled.

Conclusions.

1. The amputation stump should have a satisfactory length, a good mobile covering, a firm nonadherent cicatrix so placed as not to be subjected to pressure or irritation by the artificial limb, a freedom from pain and tenderness, and absence from edema, a shrinkage and consolidation of all parts of the stump, and a free normal mobility of the joints above.

2. The surgeon should have clearly in mind the sites of amputation best suited for the fitting of an artificial appliance.

3. The surgeon should have a knowledge of the artificial limb maker's requirements of a stump and also a knowledge of the fundamental points of the artificial limb maker's art.

4. Experience has proved the value and wisdom of using provisional appliances in the early treatment of men with amputations, and it is hoped that there will be a universal acceptance, by surgeons, of this as the approved method of treatment.

5. However perfect a prosthetic appliance may be, it must be remembered that it will never reproduce the anatomic and physiological characteristics of the amputated limb, and will never actually replace the lost member, but observation of many cases shows that faithful and intelligent practice, under guidance, will add immeasurably to the effectiveness of the artificial limb.—*Leo C. Donnelly, Detroit.*

The Treatment of Bone Cavities. By Walton Martin, M. D., Surgeon to St. Luke's Hospital, New York. *Annals of Surgery*, Vol. LXXI, January, 1920, No. 1.

It has long been recognized that cavities and tunnels in bone, when opening on the surface of the body, heal slowly or not at all.

Such cavities result from opening circumscribed pyogenic abscesses in long bones from removal of local tuberculous foci, from curetting away new growths, from excision of bone cysts and in chronic haematogenous osteomyelitis. In in-

fected compound fractures, especially gunshot fractures, very complicated cavities and tunnels result. The external or subperiosteal callus encloses one or more detached necrotic fragments or sequestra, and this casing of new bone is analogous to the involucrum of chronic haematogenous osteomyelitis.

Healing can only occur if, beneath the granulating surface, new bone or new connective tissue is formed, and thus the level of granulations is gradually raised until the cavity is filled up and the skin heals over the surface.

The most satisfactory method of dealing with a cavity with rigid walls is the removal of such portions of the bony wall as will permit the soft parts to come in contact easily with the remaining under-lying bone; the replacement of an unyielding wall by a yielding wall. This means usually the conversion of the cavity into an outer gutter. It presupposes complete removal of all foci of osteitis and every morsel of necrotic tissue or sequestrum. It means, in many instances, a most formidable and extensive operation.

In bone cavities in close proximity to a joint, the removal of the roof and side walls, with the idea of allowing the soft parts to fall in, may be almost impossible or necessitate a very difficult flap or plastic operation with damage to sound tissue. In certain tunnels following compound fractures, the removal of all the bone on one side of the tunnel leaves the shaft very weak and with poor mechanical support.

In treating infected bone cavities the following conclusions may be drawn:

1. That complete removal of all the infected bone lining the cavity, of all foreign bodies and of every particle of dead bone is essential.

2. That in the great majority of cases the cavity must be obliterated to insure healing.

3. That this is most satisfactorily accomplished by the removal of sufficient portions of the wall of the cavity to allow the soft parts to fall in and fill it up.

4. That in certain tunnels and cavities near joints some form of plugging may be indicated.

5. That of the many materials used as plugs the free fat transplants present real advantages.

6. That the two-stage operation, with careful sterilization of the cavity under bacteriological control, following the Carrel-Dakin technic, is of great value.

7. That in the small chronic bone abscesses in the ends of long bones with attenuated infection no filling or intermediate sterilization is necessary.—*Leo C. Donnelly, Detroit.*

BRACHIAL BIRTH PALSY: A PSEUDOPARALYSIS OF SHOULDER JOINT ORIGIN. By T. Turner Thomas, M. D. *American Journal of the Medical Sciences*, February, 1920.

Thomas is satisfied that 4 cases of brachial birth palsy as well as 18 adult cases following injury have been pseudopalsies due to inclusion of the brachial nerves in an axillary inflammation, consequent upon an injured shoulder joint and not true paralysis from injuries of the brachial plexus. It is a pseudoparalysis in the sense that it is only temporary in the great majority of cases. Up to within a year the theory was that these (obstetrical) cases were due to a stretching or tearing of some of the roots of the brachial plexus due to for-

cible separation of the head and shoulders during labor. Delbet and Cauchoix collected 33 cases and added two of their own of brachial paralysis in adults following dislocation of the shoulder in which the nerves were exposed at autopsy or operation, usually in the axilla. No rupture was found but the nerves were imbedded in circatricial tissue, inflammatory tissue or bloody extravasation. Lange found the same in one case. In 81 cases Wyeth and Sharp found that the "usual lesion was a dense connection tissue formation choking the plexus and thus impairing its function." Most others who have operated upon the plexus in obstetrical paralysis have interpreted these cicatrical conditions as being due to rupture of the brachial plexus. Probably the only case on record with autopsy soon after birth showing evidence of injury is that of Danyan who did not find nerve rupture but bloody extravasation around the plexus. He regarded it as evidence of injury of the plexus by forceps, and most of the writers who have since quoted the case agreed with him.

Seeligmuller thought that the bloody extravasation came from injury of the surrounding tissues by forceps. He believed with Fritsch who found bloody extravasation under the skin and in muscles in autopsies of children born by the breech that such blood could alone cause paralysis by pressure on nerves and that with the disappearance of the blood the paralysis would disappear. Fritsch cites one case of head delivery with haematoma near the lower end of the sternomastoid and paralysis of the corresponding arm which cleared up with the disappearance of the haematoma. In 1872 Duchenne in four infants localized the paralysis by electrical reaction in every case to the deltoid, biceps, brachialis-anticus and infra-spinatus. In 1874 in four adults Erb localized the paralysis by electrical reaction to the deltoid, brachialis anticus and biceps, usually to the supinator-longus and sometimes supinator brevis, in one case to the supply of median in the forearm and hand. (C V and C V 1 Duchenne-Erb Theory). This theory has been accepted without question by Sever and others. But very little evidence exists corroborating the original investigations of Erb and Duchenne. Sever's methylene blue injections into the capsule of the shoulder joint seem to prove that we do have the kind of paralysis which he found soon after birth and do not have the Duchenne Erb type, that is a paralysis of the whole arm at and below the shoulder joint but in no way affecting the nerves above the clavicle—no typical V and IV C paralysis. Kortweg on "The Results of Dislocation of the Shoulder and Its After Treatment," reviewed 845 cases. He says: "For the diagnosis of a nerve paralysis the author demands the presence of disturbances of sensation and the complete or partial reaction of degeneration." Thomas infers that "nerve paralysis" applies here to paralysis due to nerve injury and that Kortweg must have found some that were not in that class. He adds that Kortweg's diagnostic rule will some day be applied to the obstetrical paralyses by the profession generally and that the Duchenne-Erb theory will fail to stand the test. The theory of a shoulder origin with involvement of nerves occurring secondarily has gained rapidly in the last few years and has had occasional support from the beginning.

Experiments on the cadaver show that exceptional force is required for the production of a tear of the plexus by traction and it is likely that sufficient traction on the head at birth to rupture the brachial plexus has never been applied in a successful delivery.

Treatment—Practically all surgeons interested in the condition have adopted the shoulder joint treatment, although the acceptance of the shoulder origin has not been so general. The shoulder joint is injured at birth or it is not. If it is that is the time to correct the damage. If there is no displacement complete recovery will probably follow sooner or later without special treatment. If a displacement goes several weeks the chances are that operation will have to be resorted to. If it goes a year the chances are that the normal relation of the joint cannot be restored. Sever says that mere division of the subscapularis tendon is followed by reduction of the dislocation but Thomas is inclined to agree with G. G. Davis in that the good results of the operation are "due not to replacement of the head of the humerus but to the free division of the restraining tissues and placing the parts in better position." In all of Thomas' cases the shoulder deformity in obstetrical paralysis has always been the same and has three important characteristics: internal rotation of the head of the humerus, mild posterior displacement and bending downward over the head of the acromion antero-externally. It is this bent acromion in front of the humeral head that accounts for the permanence of such a mild subluxation, i. e., permits the head to rest on the posterior glenoid margin without slipping into the cavity. In all probability no case with a dislocation of the shoulder has ever recovered a normal arm although with shoulder treatment they have been very much improved, depending upon the degree of improvement in the shoulder joint.—*E. E. Hobby, Iowa City, Ia.*

STUDIES OF THE TOXICITY OF BRUISED MUSCLE TISSUE RELATIVE TO THE ETIOLOGY OF SHOCK. Delbet. Revue de Chirurgie, May-June, 1919.

Starting from the idea that phenomena of shock are due to absorption of tissue devitalized by traumatism the author has used experimental injections of muscle pulp into animals who had experienced no other trauma.

As material for injections cubes of horse meat were used, rendered aseptic by immersion in tincture of iodine and later, in order to improve asepsis, muscle tissue was taken from small animals which were totally immersed in chloric acid during 15 minutes, the muscle tissue being obtained by most painstaking aseptic technic.

In addition the muscle pulp was examined microscopically before the injection was carried out.

All injections were made into the peritoneum. The number of experiments amounted to 213 injections made on rabbits, dogs, guinea pigs, cats and rats. The author thinks it probable that the muscle pulp shows different qualities according to whether derived from muscles in state of rest or in a state of fatigue, also whether the animal was starving or well fed.

The toxic manifestations following absorption of muscle substance were found as follows:

The first cardinal symptom was that of dyspnoea. This sometimes reaches 150 respirations a minute. After a short period of increased reflex irritability reflexes disappear and the animal finally becomes torpid and comatose. From

this the author concludes that absorption of muscle tissue from bruised muscle tissue following gun-shot wound is capable of producing this symptom of shock. This symptom of dyspnoea and coma are undoubtedly manifestations of intoxication of the nervous system. On the clinical side of the predominance of nervous symptoms has been pointed out and upon the strength of this experiment the old theory of the nervous pathogenesis of shock was founded. Contrasting with this is the newer theory of the toxic nature of shock.

Death occurs under two different conditions. Sometimes the animals succumb without rallying from coma; others will regain consciousness, rally and succumb from 8 to 36 hours afterward.

The instances of early death are those in which intoxication of the nervous system exists. Where death is retarded, however, general toxic symptoms are present, especially changes in the liver cells and suprarenals. One important fact is that animals that escape death from nervous intoxication are not at all safe from succumbing finally to the toxic manifestations of the liver and suprarenals.

The changes in the liver are progressive and are found more advanced in cases that die later.

Histological examination of the liver shows degeneration and atrophy of the liver cells and appearance of chromophiles. Degenerative symptoms start first in the center of the lobules and spread toward the periphery.

The toxicity of the liver substance itself was proven by injections in a series of animals.

By comparing the effects of muscle injections from one species to another the author also established conditions of homo or hetero toxicity. The author concludes that the symptoms of shock which above all seem to be due to a state of nervous depression, there is a factor active on the order of anaphylaxis created by penetrating of certain albumines into the organism. In this way, it may be explained, that shock symptoms are frequent and severe in war wounds. He also makes a distinction according to previous state of nutrition in that previous protein nourishment will render individuals much more susceptible to this anaphylactic symptom of shock. For this reason he also believes that the rural population with more vegetarian diet will prove more resistant to shock following crushing wounds than the city population which depends more upon protein diet. From this consideration the author draws certain practical conclusions as regards post operative diet. He emphasizes the importance of vegetable diet both immediately before and after the operation.—*Arthur Steindler, Iowa City, Ia.*

THE USES OF FREE TRANSPLANTS OF THE FASCIA LATA IN SURGERY. G. Gray Turner. *B. M. J.*, January, 17, 1920.

The author uses free transplants of the fascia lata for protecting sutured nerves or tendons where there is loss or extensive damage to the superficial tissue. The advantages are that it prevents sloughing, inhibits sepsis, and promotes the rapid growth of granulations.

Further, he advocates the use of a portion of fascia rolled as a cigarette and sutured between the ends of tendons to replace the loss of these structures. Fine catgut is used as suture material, the ends of the tendon being always inserted into the roll of fascia.

Further uses of the fascia lata transplant are to cover exposed brain and for repair of the urethra.—*Dr. Thomson.*

KNEE JOINTS. H. Winnett Orr. *Nebraska State Medical Journal*, February, 1920, Vol. 2, p. 33.

There are two groups of knee joint injuries—internal derangements and compound injuries. The former are often infective, and may be acutely suppurative; the latter are generally acutely suppurative. The treatment implies three principle agents—surgical operation, splint, and plaster of paris. All other treatment is secondary to these and should not be relied upon too much, but should be used only in association with the principal agents. Of these are mentioned heat, light, massage, electricity, etc. Many knee joint conditions need immobilization only, as in some cases of ruptured crucial ligaments.

General Sir Robert Jones has shown the possibilities, simplicity and relief brought by removal of loose portions of cartilage of external or internal semilunars.

In suppurative processes of the knee joint associated with fracture of lower end of femur or upper end of tibia, immobilization with adequate drainage is an essential.

Relative to the recent discussion concerning the treatment of infected knee joints with motion to prevent ankylosis, these cases may be classified as to original condition and as to treatment advisable into four groups. First, acute suppurative without compound injury or fracture. After adequate drainage these may be treated in some cases with motion throughout.

The second group constitutes cases of compound injury, stab or bullet wounds without extensive damage to articular surfaces. They may be often closed and heal primarily; however, should suppuration occur thorough drainage and the Willems method may be instituted.

In the third group, where compound injury is complicated by fracture of femur or tibia, adequate drainage and perfect immobilization must be used. Ankylosis is to be expected, and should be in knee flexion of 20 to 25 degrees. In certain of these cases amputation is necessary.

The fourth group constitutes cases from the three other groups which have run a long suppurative course with pus pocketing up the femur and thigh and down the leg with general septicemia. Some of these extremities are saved by radical drainage and proper immobilization in Thomas splint and plaster of Paris. Amputation, when necessary, is followed by improvement resulting from good drainage and a period of rest.

For the Willems method of mobilization of the knee in those cases which were formerly permitted to ankylose, both the patient and the surgeon should be carefully selected.—*J. E. M. Thomson, Lincoln.*